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REVISION OF THE GENUS EUSCHISTUS IN MIDDLE AMERICA (HEMIPTERA, PENTATOMIDAE, PENTATOMINI)

L. H. ROLSTON

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REVISION OF THE GENUS EUSCHISTUS IN MIDDLE AMERICA (HEMIPTERA, PENTATOMIDAE, PENTATOMINI)

L. H. ROLSTON[1]

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ABSTRACT: The species of *Euschistus* known from Middle America, and those from adjacent regions that may occur there, are described and keyed. Thirty-six species are included, 13 of them new species: *Euschistus achatadus*, *E. agudus*, *E. chiapus*, *E. egglestoni*, *E. leonensis*, *E. quadrator*, *E. subinteger*, *E. ruckesi*, *E. schaffneri*, *E. stali*, *E. vetus*, *E. zafadus*, and *E. zagus*. One new subspecies, *E. crenator orbiculator*, is described.

New combinations are *Padaeus teapensis* (Distant), 1890, and *Mormidea integella* (Distant), 1893, both species removed from *Euschistus*.

Euschistus verrucifer (Stål, 1872) is returned to *Padaeus* Stål, 1862, the genus in which it was described originally.

New synonymy recognized is *Euschistus trisinuatus* Stål, 1872, as a synonym of *E. atrox* (Westwood), 1837; *E. capitatus* Distant, 1890, as a synonym of *E. biformis* Stål, 1862; *Pentatoma crocipes* [Westwood], 1837, *Euschistus proximus* Dallas, 1851, and *E. reductus* Walker, 1867, as synonyms of *E. crenator* (Fabricius), 1794; *E. quadrimaculatus* Distant, 1887, as a synonym of *E. heros* (Fabricius), 1798; *E. impictiventris* Stål, 1872, as a synonym of *E. servus* (Say), 1832; and *E. zopilotensis* Distant, 1890, as a synonym of *E. strenuus* Stål, 1862.

A lectotype and paralectotypes are designated for *E.*

trisinuatus Stål, *E. rugifer* Stål, 1872, and *E. zopilotensis* Distant, 1890.

The subgenus *Paraschistus* Kirkaldy, 1909, proves to be neither a natural nor convenient division and is placed in the synonymy of the nominate subgenus.

INTRODUCTION

The genus *Euschistus* has grown by accretion since its erection (Dallas 1851) until it is now the largest of the pentatomine genera. The principal taxonomic literature pertaining to Middle American *Euschistus* species, subsequent to the work of Dallas, consists of a century old synopsis by Stål (1872), a few illustrations by Distant (1880–93) and original descriptions of species. The sum of the literature does not permit recognition of all the named species. Consequently, some synonymy and many undescribed species have gone unrecognized, and identification of even the agriculturally important species is often uncertain.

This contribution toward a generic revision is offered with the misgivings that it may contain a few errors of fact and the realization that it is probably incomplete, but with the expectation that the descriptions, figures and keys will permit identification of the known species of *Euschistus* occurring in Middle America (Mexico and Central America).

A key is provided to separate the Middle American genera that are most likely to be confused with *Euschistus*, as well as another to the species of *Euschistus* known from Middle America including those from adjacent regions that may occur in Middle America. For each species there is a description or redescription, the latter abbreviated if the species has been described or redescribed recently in a readily available journal.

KEY TO GENERA OF SIMILAR APPEARANCE

Nearly all *Euschistus* species have a general conformity in appearance that permits proper generic placement on the basis of familiarity with a few species. Since the genus has representatives of economic importance almost everywhere in the Western Hemisphere, it is one of the most widely recognized of the hemipteran genera. Nevertheless, in Middle America there are a few species in neighboring genera that may be mistaken for *Euschistus* because of similarity in color, size and general appearance. The following key separates these genera from *Euschistus* and from each other only in Middle America.

1. Femora armed with pair of stout preapical tubercles .... *Sibaria*
1′. Femora unarmed or bearing double row of low tubercles 2
2(1). Tylus and juga usually subequal in length, any difference little or no greater than width of tylus at apex 3
2′. Tylus much longer or much shorter than juga 8
3(2). Double row of low tubercles, each bearing a seta, on inferior face of femora, best developed on anterior femora; costal margin of hemelytra obtusely denticulate toward base .... *Agroecus*
3′. Femora setose, otherwise unarmed; costal margin of hemelytra without denticles 4
4(3). Length of basal segment of antennae subequal to distance from its base to apex of head 5
4′. Basal segment of antennae much shorter .... *Tibraca*
5(4). Bucculae evanescent or truncate at base of head .... *Euschistus*
5′. Bucculae prolonged into lobe at base of head 6
6(5). Anterolateral margins of pronotum rounded, smooth or vertically rugose; humeral angles acutely produced .... *Padaeus*
6′. Anterolateral margins of pronotum carinate, entire; humeral angles obtusely rounded 7
7(6). Head deeply inserted into pronotum, imaginary line drawn across anterior limits of pronotum bisecting each eye near middle .... *Menecles*
7′. Imaginary line drawn across anterior limits of pronotum passing near posterior margin of each eye .... *Hymenarcys*
8(2). Tylus spinosely produced far beyond juga 9
8′. Tylus much shorter than juga 10
9(8). Eyes contiguous with pronotum; anterolateral pronotal margins denticulate .... *Berecynthus*
9′. Eyes not touching pronotum; anterolateral pronotal margins smoothly rounded .... *Proxys*
10(8). Juga convergent or contiguous before tylus; black tubercle in basal angles of scutellum .... *Galedanta*
10′. Juga dehiscent, acute apically; without tubercles in basal angles of scutellum .... *Dichelops*

GENERIC CHARACTERS OF *EUSCHISTUS*

Euschistus Dallas, 1851

Euschistus Dallas, 1851, p. 193.—Stål, 1867, p. 528.—Stål, 1872, p. 23.—Van Duzee, 1904, p. 43.—Kirkaldy, 1909, p. 63.—Torre-Bueno, 1939, p. 219.

Paraschistus Kirkaldy, 1909, p. 63 (as subgenus). **New Synonymy.**

Dorsum drably colored in hues of yellow, brown or black, sometimes inconspicuously suffused in part with dull shades of red. Ventral surfaces similarly but usually more lightly colored, occasionally flecked with red, in some species green in life; appendages often tinted in part with pale red. Punctation moderate in density and depth, evenly to somewhat irregularly distributed; dorsal punctures predominantly light castaneous to black; ventral punctures concolorous with or darker than sclerites.

Length of body without membrane of hemelytra 6.9–14.1 mm.

Head approximately as long as wide across eyes; lateral margins sigmoid before eyes, narrowing toward rounded apex, often subparallel for middle third of distance from eyes to apex. Juga usually nearly equal to tylus in length, often slightly longer, rarely contiguous at apex, occasionally a little shorter, never acute at apex. Ocelli located between and well behind reticulated part of eyes; distance across ocelli subequal to or somewhat greater than half distance across eyes. Antenniferous tubercles largely exposed from above, obtusely toothed laterally at apex. Basal segment of antennae nearly reaching to slightly surpassing apex of head; remaining four segments longer than first. Bucculae near anterior limits usually produced ventrad into obtuse tooth, extending more or less percurrently to base of head, there evanescent to truncate. Rostrum extending between or slightly past metacoxae; apex of basal segment nearly reaching to slightly surpassing termination of bucculae; second segment much longer than others, its apex falling between procoxae and mesocoxae; third and fourth segments approximately equal in length.

Pronotum at meson nearly to almost half again as long as head; width across humeri about 2.3 to 3.3 times length. Emargination of anterior margin, behind vertex of head, broad, moderately deep. Anterolateral margins entire or, before humeri, undulating, denticulate or vertically rugose. Humeri weakly to strongly produced, broadly rounded to spinose, sometimes considerably elevated above disk.

Scutellum subequal in length and basal width, or somewhat longer than wide. Lateral margins narrow rapidly in gently convex arcs, along frena, for 0.5 to 0.7 of distance from base to apex, then gradually converge toward moderately to narrowly rounded apex. Small to moderate sized fovea usually present in basal angles.

Hemelytra leave connexiva slightly to rather broadly exposed; coria with inner angle rounded near apex of scutellum, posterior margin oblique, outer angle acute. Membrane vitreous, sometimes with numerous small dark spots, to darkly translucent, nearly covering to considerably surpassing apex of abdomen; venation simple to reticulate.

Pleural region on each side frequently marked with five dark spots: one at anterolateral angle of prothorax, another on mesopleuron at dorsal end of supracoxal cleft, one at base of each subcoxae on pleural suture; spots on subcoxae and auricle of ostiole all in line; one or more of five spots sometimes obscure or obsolete. Evaporative area on each side rugose, matte, uniformly colored or flecked with red or contrastingly punctate, covering much of metapleuron, extending onto mesopleuron, reaching about halfway or somewhat less from auriculate ostiole to lateral margin of metapleuron. Prosternum and metasternum nearly flat or shallowly sulcate beneath rostrum. Anterior portion of mesosternum with weak median carina that expands laterally along anterior margin. Femora setose but otherwise unarmed; fore tibiae provided with tuft of setae about two-thirds distance from base toward apex; all tibiae sulcate. Abdomen without median tubercle or spine at base.

SYNONYMY: Only three Middle American species assigned to *Euschistus* have been placed in other than the nominate subgenus. One of these, *E. spurculus*, was described by Stål (1862) in the subgenus *Lycipta*, but a decade later Stål (1872) correctly relocated this species in the nominate subgenus.

Kirkaldy (1909) created the subgenus *Paraschistus* to contain *E. integer* Stål and *E. integellus* Distant, apparently because of all the species then included in *Euschistus* these alone were seemingly characterized by having the anterolateral pronotal margin entire. After examining the type of *Euschistus integellus* Distant, I am confident that this species should become *Mormidea integella* (Distant), leaving for consideration only *E. integer*, the type species of *Paraschistus*.

The single character purporting to distinguish the subgenus *Paraschistus* from congeners, the lack of denticulation on the anterolateral pronotal margins, is not entirely consistent. The degree of denticulation of these margins varies somewhat within some species of the genus as well as among species. In some specimens of *E. integer* the apical portion of the anterolateral pronotal margins undulates as it does in some specimens of a few congeners that usually have these margins at least weakly denticulate, *E. spurculus* for example. As a result, *Paraschistus* cannot be separated cleanly from the nominate subgenus. In other respects, *E. integer* shows no greater dissimilarity from congeners than is to be expected among species. It seems, therefore, that *Paraschistus* is neither a natural nor a convenient taxon, and it should not stand. All Middle American species of *Euschistus* should be placed in the nominate subgenus.

SPECIES TRANSFERRED TO *PADAEUS* STÅL, 1862

Euschistus verrucifer (Stål), 1862 and *E. teapensis* Distant, 1890, both described from Middle America, are transferred to the genus *Padaeus* Stål, 1862. Stål erected this genus to contain *Mormidea viduus* Vollenhoven, 1868, and *Padaeus verrucifer*, but he later (1872) moved *P. verrucifer* to *Euschistus* while adding *P. trivittatus*. A translation of Stål's short generic description of *Padaeus* (Stål, 1862, p. 101) is pertinent:

> "Body oval, quite convex beneath. Head triangular, center lobe slightly longer than lateral [lobes]; bucculae percurrent, abruptly abbreviated posteriorly. Basal segment of rostrum slightly shorter than bucculae, second shorter than two apical segments together. Apex of scutellum quite narrow. Mesosternum carinate. Abdomen slightly wider than hemelytra. Legs unarmed.
>
> "A genus akin to *Euschistus*."

Distant, 1880, added to this (p. 61) ". . . the margins of the pronotum are not denticulated; and the anterior tibiae only are sulcated . . . ."

The critical character in Stål's generic description is the form of the bucculae, since the remaining characters together apply equally well to several *Euschistus* species. Viewed laterally, the bucculae of *Padaeus* species actually extend as a lobe at the base of the head, while in *Euschistus* species the bucculae are evanescent or, less commonly, truncate posteriorly. Distant's observation regarding the pronotum is both accurate and pertinent, but he erred in stating that the middle and posterior tibiae of *Padaeus* species lack a sulcus.

P. viduus, the type species, *P. verrucifer* and *P. teapensis* all have the bucculae surpassing the basal segment of the rostrum and terminating in a lobe at the base of the head, and all have vertical rugae rather than denticles along the rounded anterolateral pronotal margins. These species also agree in all other respects with the original description of the genus *Padaeus*.

INTRASPECIFIC VARIATION

The somber hues of *Euschistus* species severely limit the possibilities of conspicuous variation in coloration. However, melanistic forms do occur in a few species, *E. biformis* for example, and in several species the ventral surfaces are sometimes entirely or partially flecked with pale red. Annular markings on the antennae are generally stable, but minor markings on the appendages and maculae on the abdominal sternites are subject to considerable variation.

Mostly early hemipterists, working with few specimens, attached much significance to the interspecific differences that they observed in the proportionate length of antennal segments. Unfortunately, these proportions are often variable and of little diagnostic value. In most species the length of the tylus relative to the juga is rather uniform, but in a few species this relationship is variable.

The humeri of several species vary notably in the degree to which they are produced laterally and, hence, in the form of the humeral angle. This variation is correlated with season in *E. tristigmus* (Say), but the extremes in some species have been collected together on widely separated dates.

TAXONOMIC VALUE OF THE GENITALIA

The male genitalia have easily discernible interspecific differences and with few exceptions show little intraspecific variation. Consequently, the sclerotized parts are useful in establishing the identity of all species and are the only convenient means of separating some of them. The structure of the genital cup is usually sufficient to separate the species, and this can be examined with little or no preparation of the specimen. Additional characters are available by removing the parameres and parts of the genitalia within the pygophore.

The conjunctiva, median penal lobes, penisfilum, theca and thecal processes differ interspecifically. However, the form of the membranous conjunctiva, and to a much lesser extent that of the median penal lobes, varies according to the degree of inflation attained during the maceration process. Conjunctival lobes may have been overlooked where few specimens were available for dissection. Consequently, little importance is attached to the form of the conjunctiva as a means of discriminating among species. The penisfilum is often, even usually, displaced from its normal position during dissection. Only its general form, length, and place of emergence are significant.

The female genitalia have not been surveyed methodically. The genital plates are seldom taxonomically helpful, but the spermatheca differs among the few species that were examined. The differences are sometimes more subtle than those found in the male genitalia and the risk of erroneous interpretation is correspondingly greater. Use of the spermatheca for identification is unlikely to become routine practice in the genus since its removal is a tedious process that results in some mutilation of the specimen.

The genus cannot be delineated on the basis of the genital characters of either sex. The general construction of the spermatheca is substantially the same as that in such distantly related genera as *Lopadusa* Stål (Becker and Grazia, 1970) and *Chloropepla* Stål (Grazia, 1968). Intrageneric differences among males surpass the differences between some species of *Euschistus* and some species of neighboring genera.

DISSECTION OF GENITALIA

Most of the characters used to distinguish among the species are in plain view, but often the pygophore must be extracted from beneath the membrane of the hemelytra to see clearly the structures within the genital cup. This may be done quickly by immersing the specimen for a minute or two in nearly boiling water, then pulling gently on the pygophore with fine forceps until the genital cup is exposed. Dissecting the genital structures from within the pygophore is not a particularly formidable task in this genus. The pygophore is extracted as above, detached from the abdomen, and the tissues macerated in a 10 per cent solution of potassium hydroxide. Allowing the pygophore to stand overnight in cold caustic solution produces the best results, but maceration in hot caustic is much faster and usually satisfactory. The pygophore is transferred for dissection from the caustic solution into water made weakly acid to arrest further maceration. The proctiger should pull free easily. The basal plate and theca may then be pushed into the genital cup, working through the orifice at the base of the pygophore, and removed before detaching the parameres.

USE OF DRAWINGS

Since the illustrated structures are irregular forms, their appearance from various aspects differs substantially. Careful orientation of the specimens is therefore requisite for meaningful comparison with the drawings.

Illustrations of the pronotum were made with the anterior and posterior margins on the same focal plane at the meson and the apex of both humeral angles on a parallel focal plane.

Part of the pygophore is illustrated for most species from caudal, ventral and dorsal views. These drawing were made from specimens oriented as follows: caudal view with the dorsal surface of the pygophore at the sides of the genital cup perpendicular to the focal plane; ventral view with the anterior and posterior margins of the pygophore on the same focal plane at the meson; dorsal view with the surface of the pygophore at the sides of the genital cup on the same focal plane.

The bases of the parameres serve as a reference in the orientation of this structure.

The genital plates of the female were drawn with the anterior margin of the first gonocoxa and the apical margin of the ninth paratergite on the same focal plane.

The terminology used is that of McDonald (1966).

KEY TO *EUSCHISTUS* SPECIES OF MIDDLE AMERICA

1. Prominent impunctate fascia present intramarginally on each side of scutellum; similar but less pronounced fascia lying behind cicatrices and along veins of coria .... *E. lineatus* Walker

1′. Without these impunctate fasciae 2

2(1). Lateral margins of abdomen narrowly subcalloused and much paler than adjacent abdominal disk .... *E. comptus* Walker

2′. Lateral margins of abdomen neither subcalloused nor much paler than adjacent abdominal disk 3

3(2). Membrane of hemelytra with numerous small dark spots 4

3′. Membrane of hemelytra unspotted 7

4(3). Spiracles black .... *E. zagus*, new species

4′. Spiracles nearly concolorous with surrounding area of sternite 5

5(4). Evaporative areas punctate with black; conspicuous impunctate fascia traversing pronotum between humeri ... *E. crassus* Dallas

5′. Evaporative areas not punctate with black; pronotum lacking well-defined impunctate fascia 6

6(5). Projection of superior ridge entire above proctiger (Fig. 291); abdominal venter usually clearly marked with large black longitudinally elongated median spot on one or more segments .... *E. tristigmus* (Say)

6′. Projection of superior ridge above proctiger notched mesially on free margin (Fig. 202); abdominal venter lacking large black median spots .... *E. servus servus* (Say)

7(3). Basal third of costal margin of coria plainly reflexed; anterolateral margins of pronotum broadly reflexed .... *E. schaffneri*, new species

7′. Costal margin of hemelytra not reflexed, or reflexed only at very base; anterolateral pronotal margins narrowly or not at all reflexed 8

8(7). Anterolateral margins of pronotum entire, or undulating, or with very obtuse low denticles on anterior half or less (Figs. 58–59, 130, 188–189, 251) 9

8′. Anterolateral margins of pronotum strongly denticulate at least on anterior third 12

9(8). Apical two antennal segments entirely black; apex of scutellum not pale .... *E. spurculus* Stål

9′. Apical two antennal segments rufous to brown or with pale basal ring; apex of scutellum pale at least along margin 10

10(9). Apical two antennal segments fuscous excepting yellowish brown ring on basal fourth of each segment .... *E. chiapus*, new species

10′. Apical two antennal segments almost uniformly brown or rufous 11

11(10). Humeri right angular (Fig. 251); inferior ridge entire (Figs. 253) .... *E. subinteger*, new species

11′. Humeri rounded (Fig. 130); inferior ridge with median notch (Figs. 131, 132) .... *E. integer* Stål

12(8). Membrane of hemelytra appearing brown against white paper inserted beneath membrane 13

12′. Membrane of hemelytra clear or fumose 18

13(12). Ventral surfaces including evaporative areas contrastingly black punctate 14

13′. Ventral surfaces pale yellow to black, concolorously punctate .. 16

14(13). Very apex of scutellum reflexed on each side of a narrow median longitudinal depression .... *E. zafadus*, new species

14′. Apex of scutellum nearly flat 15

15(14). Meson of pronotum narrowly calloused, pale; bucculae near anterior limits without an obvious tooth .... *E. achatadus*, new species

15′. Meson of pronotum neither calloused nor pale; bucculae near anterior limits with an obtuse tooth directed ventrad .... *E. ruckesi*, new species

16(13). Spiracles black or ringed with black; venter brownish yellow to black .... *E. biformis* Stål

16′. Spiracles concolorous with yellowish venter 17

17(16). Humeral angles strongly produced upward as well as outward (Figs. 18–19); tylus slightly exceeding juga; dorsum without pale calloused spots .... *E. agudus*, new species

17′. Humeral angles less elevated above pronotal disk; juga longer than tylus, convergent (Fig. 10); pale calloused spot present on posterior margin of each cicatrice near mesial boundary; similar spots scattered on pronotum, scutellum and hemelytra .... *E. acutus* Dallas

18(12). Evaporative areas contrastingly punctured with black 19

18′. Evaporative areas unicolorous or flecked with red 22

19(18). Denticles on anterolateral margins of pronotum small, blunt, peg shaped, widely spaced; tylus surpassing juga by about width of tylus at apex of juga (Fig. 170) .... *E. rufimanus* Stål

19′. Denticles on anterolateral margins of pronotum mostly angular and closely spaced; tylus extending little or not at all beyond juga 20

20(19). Apex of scutellum ivory; membranes between abdominal sternites black between imaginary line connecting spiracles on each side, contrasting with yellowish sternites; three diffuse, often weak, longitudinal vittae on venter, one mesial, one on each side covering mesial end of pseudosuture .... *E. heros* (F.)

20′. Apex of scutellum not conspicuously paler than disk, or only very margin paler; intersegmental membranes of abdominal venter usually darker than sclerites but not fuscous or black; abdominal vittae usually lacking 21

21(20). Posterior margin of pygophore trisinuately emarginate from caudal view (Fig. 28); disk of pronotum weakly convex before humeri from lateral view (Fig. 31) .... *E. atrox* (Westwood)

21′. Posterior margin of pygophore with one moderately deep emargination from caudal view (Fig. 147); pronotal disk moderately convex before humeri from lateral view (Fig. 150) .... *E. nicaraguensis* Rolston

22(18). Numerous blackish spots scattered on hemelytra; narrow, sparsely punctate, transverse fascia between humeri; pronotum before fascia and head thickly punctate, darker than remainder of dorsum .... *E. obscurus* (P.B.)

22′. Hemelytra without spots, or if marked with a few spots then not punctate and colored as above 23

23(22). Posterior margin of pygophore conspicuously protruding in lateral view (Fig. 218); spiracles usually black .... *E. stali*, new species

23′. Posterior margin of pygophore smoothly contoured from lateral view; spiracles concolorous with surrounding area of sternite 24

24(23). Inferior ridge of pygophore paralleling posterior margin, separated from it by narrow sulcus (Figs. 40, 182); most denticles on anterolateral margins of pronotum widely separated, subacute, inclined toward humeri (Figs. 35–37, 179) 25

24′. Inferior ridge of pygophore not paralleling posterior margin; denticles closely spaced, neither inclined toward humeri nor subacute 26

25(24). Membrane of hemelytra with large brownish spot at inner angle; veins in part reticulate; scutellar disk rough, tumid; pronotum with transverse, sparsely punctate, calloused fascia between humeri .... *E. rugifer* Stål

25′. Membrane of hemelytra lightly fumose; veins not reticulate; scutellar disk often somewhat uneven, gently convex; pronotum with no more than obscure fascia between humeri .... *E. bifibulus* (P.B.)

26(24). Posterior margin of pygophore trisinuately emarginate in caudal, ventral and dorsal views (Figs. 296–298) .... *E. vetus*, new species

26′. Posterior margin of pygophore not trisinuate in all of above aspects 27

27(26). Middle half of posterior margin of pygophore with moderately deep, evenly concave emargination in caudal view (Fig. 20) .... *E. agudus*, new species

27′. Emargination of posterior margin of pygophore differently shaped or lacking 28

28(27). Posterior margin of pygophore with a broad, shallow, sinuous to subrectangular emargination in ventral aspect (Figs. 115–116) .... *E. emoorei* Rolston

28′. Posterior margin of pygophore not as above 29

29(28). Posterior margin of inferior ridge in dorsal view forming very open V with arms directed anterolaterad; superior ridge little produced above proctiger (Figs. 226, 236, 245); denticulate margins of pronotum and denticles often much paler than disk 31

29′. Posterior margin of inferior ridge arched evenly or sinuously cephalad in dorsal view (Figs. 263, 88); superior ridge produced posteriorly above proctiger, with broad sinuous emargination or notch (Figs. 264, 89); denticulate margins of pronotum and denticles usually as dark as or darker than disk 30

30(29). Genital cup with deep, transverse oval or reniform mesial impression defined anteriorly and laterally by inferior ridge; superior ridge notched mesially (Fig. 89) *crenator* group 34

30′. Excavation of genital cup between inferior ridge and posterior margin not limited to deep mesial impression, smooth, or with low protuberances or longitudinal sulcus at posterior margin; superior ridge broadly and sinuously emarginate (Fig. 264) *sulcacitus* group 36

31(29). Narrow punctate line along meson on tongue of scutellum bordered on each side by narrow impunctate or very sparsely punctate fascia; vague macula in center of disk of scutellum, another along border on each side at inner angle of corium .... *E. leonensis* Rolston

31′. Tongue of scutellum rather uniformly punctate and colored except narrow border of apex; disk without macula 32

32(31). Humeral angles acute (Fig. 242) .... *E. strenuus* Stål

32′. Humeral angles bluntly rounded to obtusely angulate (Figs. 223, 241) 33

33(32). Width of pronotum at humeri seldom exceeding 5.4 mm in males; small denticle on lateral walls of genital cup usually more prominent than obtuse denticular production above it on rim of genital cup (Fig. 245) .... *E. strenuus* Stål

33′. Width of pronotum at humeri seldom less than 5.5 mm in males; denticle on lateral walls of genital cup usually less prominent than production on rim of genital cup (Fig. 226) .... *E. egglestoni* Rolston

34(30). Posterior margin of pygophore sinuate in ventral view, mesial concavity moderately broad, shallow to moderately deep (Figs. 85–87) .... *E. crenator crenator* (F.)

34′. Posterior margin of pygophore narrowly or not at all concave mesially in ventral view (Figs. 96–97, 104–105) 35

35(34). Posterior margin of pygophore rounded in ventral view, with narrow, shallow, mesial emargination (Fig. 96); or somewhat truncate apically and slightly produced on each side of emargination (Fig. 97) .... *E. crenator orbiculator*, new subspecies

35′. Posterior margin of pygophore broadly truncate from ventral view, usually with narrow, shallow, mesial notch (Figs. 104–105) .... *E. quadrator*, new species

36(30). Posterior margin of pygophore quite sinuate in dorsal view (Fig. 271); short black carina anterolaterad of parameres on lateral walls of genital cup .... *E. olacitus* Rolston

36′. Posterior margin of pygophore rather evenly arcuate in dorsal view (Figs. 263, 277, 283); small, black denticle anterolaterad of parameres of lateral carina 37

37(36). Dorsal margin of pygophore with broad, shallow, mesial notch in caudal view (Fig. 281) .... *E. sulcacitus* Rolston

37′. Dorsal margin of pygophore evenly or sinuately concave in caudal view (Figs. 261, 275) 38

38(37). Low, broad, mesial protuberance in excavated area behind inferior ridge; posterior margin of pygophore somewhat sinuately concave in caudal view (Fig. 261), slightly trisinuate from ventral view (Fig. 262), somewhat thickened .... *E. corcovacitus* Rolston

38′. Area behind inferior ridge smoothly excavated; posterior margin of pygophore somewhat sinuately concave in caudal view (Fig. 275), nearly straight in ventral view (Fig. 276) .... *E. palacitus* Rolston

))

Euschistus achatadus, new species f.1-9

Dorsum sordid yellow to fuscous, becoming nearly black on anterior part of pronotum and head; numerous sordid yellow subcalloused spots and rugae scattered over dorsum, mesial line of same color divides pronotum; punctures dark castaneous to black, unevenly arranged, many in irregular transverse rows, especially on base of pronotum and on scutellum. Ventral surfaces sordid yellow with moderately dense dark castaneous to black punctation. Length without membranes 8.4 mm.

Head as wide as long, 2.0 mm. Lateral margins of juga subparallel for middle third of distance from eyes to apex of head. Tylus and juga equally long, each obtusely rounded at truncate apex of head. Vertex lacking impunctate area mesad of eyes. Antennae sordid yellow, becoming brown distally on third segment; longitudinal dark stripe on inner and outer surfaces of basal segment; broad basal ring and apex of last segment pale; length of segments 0.5; 0.7; 0.9; 1.3; 1.5 mm. Bucculae not obviously toothed anteriorly, slightly surpassing apex of basal segment of rostrum.

Pronotum 4.8 mm. wide, 1.9 mm. long at meson. Disk impressed posterior to cicatrices, also between elevated cicatrices and anterior pronotal margin. Anterolateral margins nearly straight, bearing four or five entirely or partially yellowish denticles (Fig. 1). Humeri little produced, broadly rounded, narrowly margined with sordid yellow.

Scutellum slightly narrower at base than long, 2.6 by 2.9 mm., with small black fovea at basal angles; apex punctuate. Membrane of hemelytra dusky, veins not reticulate. Connexiva fuscous, interrupted in middle of each segment by paler marginal spot; punctation dense, coarse, shallow.

Pleural surfaces of thorax bear five black spots on each side, these somewhat obscured by black punctation. Evaporative areas darkly punctate. Mesosterna and metasterna black. Femora ornate with many large to small dark spots. Tibiae marked with a few large dark spots and diffuse maculae.

Large black mesial spot on each abdominal sternite, from base to apex of abdomen each spot larger than preceding one. Spiracles and spot on basal angles of each segment black.

Posterior margin of pygophore with deep, broad, mesially truncate emargination in both caudal and ventral views, approximately paralleled by dorsal margin of inferior ridge in caudal view (Fig. 2); pygophore short in ventral view (Fig. 3); in dorsal aspect, posterior margin of pygophore sinuous, that of inferior ridge deeply concave mesially (Fig. 4). Superior ridge little produced. Preapical tubercles of proctiger fused mesially (Fig. 5). Thecal processes long, slender (Fig. 7); median lobe of theca weakly produced, broad, truncate, unpigmented. Conjunctiva with lateral appendage on each side and one median appendage (Fig. 8); much of lateral appendages heavily sclerotized, mesial appendage entirely hyaline. Short penisfilum lies within trough formed by median penal lobes.

HOLOTYPE: male, labeled (a)[1] Matagalpa K. 138, Nicaragua 26 VII 70 (b) L. H. Rolston, Collector. Type no. 72120, U. S. National Museum.

PARATYPES: none.

DISTRIBUTION: Nicaragua.

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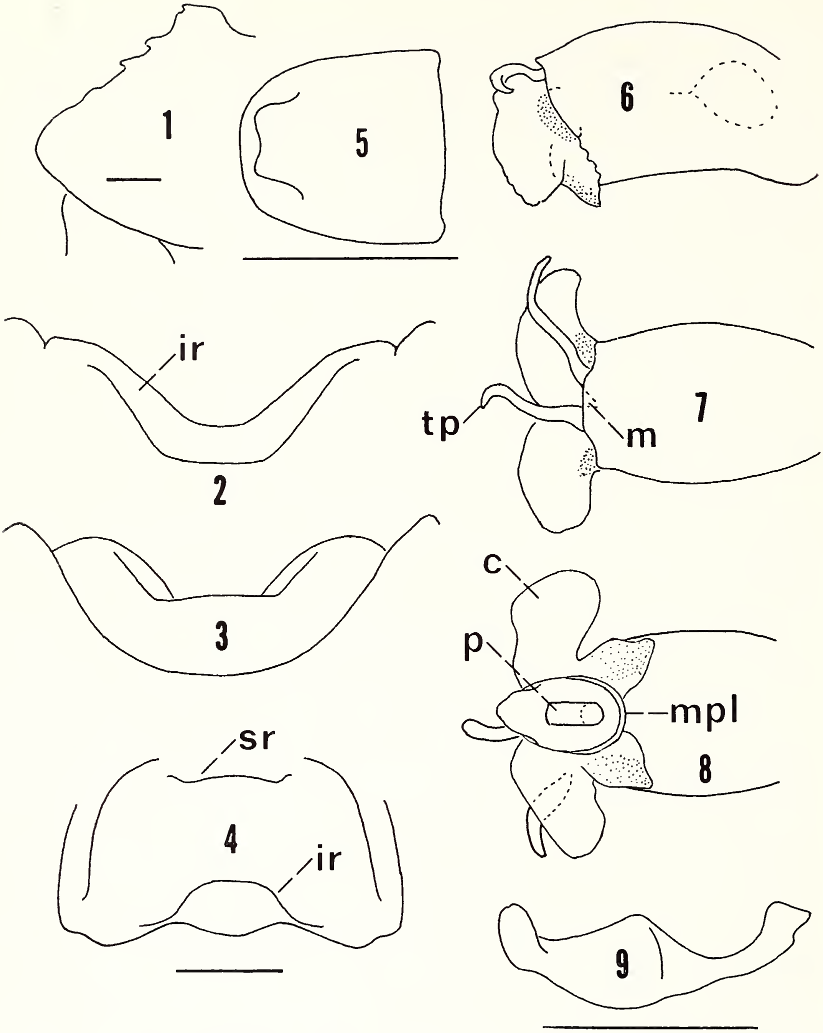
[1] Letters in parentheses indicate the number and position of labels with (a) being the topmost label next to the insect.



FIGS. 1–9. *E. achatadus*. Fig. 1. Pronotum. Fig. 2. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 3. Pygophore, ventral aspect. Fig. 4. Genital cup, dorsal aspect, omitting parameres and proctiger; posterior margin of inferior ridge (ir) and superior ridge (sr). Fig. 5. Proctiger. Fig. 6. Theca and related structures, lateral aspect. Fig. 7. Theca and related structures, dorsal aspect; median lobe (m), thecal processes (tp); Fig. 8. Theca and related structures, ventral aspect; conjunctiva (c), median penal lobes (mpl), penisfilum (p). Fig. 9. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

COMMENT: Among the species of this genus in Middle America, *E. achatadus* is unique in lacking an impunctuate area at the mesial border of the eyes and in having the tooth near the anterior limits of the bucculae reduced to an obscure lobe. The median row of black spots on the abdominal venter facilitates its recognition.

Euschistus acutus Dallas, 1851

Euschistus acutus Dallas, 1851, p. 202.—Stål, 1872, p. 24.

Dorsum fuscous, grading to black on anterolateral pronotal margins, on humeri, and at least basally on head; numerous yellowish brown subcalloused spots on pronotum, scutellum, base of hemelytra; a lacuna of same color near distal end of radial vein; a small calloused yellow spot on posterior margin of each cicatrice near mesial boundary; punctation rather dense, black, arranged in irregular transverse rows on base of pronotum. Length without membrane 7.6–9.0 mm.

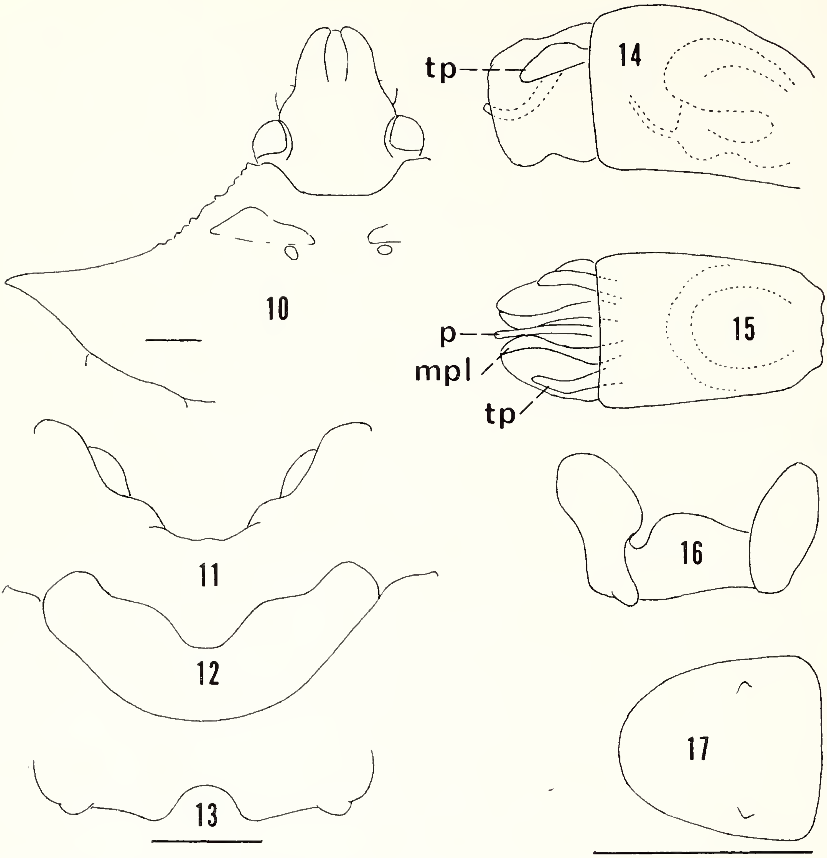
Head slightly longer than or equal to width across eyes, 1.6–1.8 mm. wide. Juga slightly surpassing tylus, inclined near apex from tylus to elevated margin, lateral margins not parallel. Basal segment of antennae brownish yellow with dorsolateral longitudinal streak, narrow incomplete apical ring and elongated ventral spot fuscous; remaining segments fuscous excepting dorsal longitudinal streak on second, basal fifth of third and fourth, and basal half of fifth yellowish; length of segments 0.5–0.6; 0.8–1.0; 0.8–1.0; 1.4–1.6; 1.4–1.7 mm. Bucculae slightly shorter than or equal to length of first rostral segment.

Pronotum 1.9–2.1 mm. long at meson, 3.0–3.2 times as wide at humeri. Anterolateral margin concavely arcuate, denticulate for about one-half distance from apex to humeral angle; denticles black, small, acute or reduced to vertical rugae. Humeral angles strongly produced, acute to spinose, neither elevated nor turned forward (Fig. 10).

Scutellum about one-tenth wider at base than long, 2.7–3.1 mm. long at meson, with small black fovea at basal angles; apex punctate. Membrane of hemelytra darkly translucent, veins simple or furcate. Abdominal tergites nearly concolorous with venter. Connexiva narrowly exposed, black, interrupted in middle and narrowly at apex of each segment with yellow.

Ventral surfaces orange yellow with concolorous punctation. Pleural surfaces of thorax bear five black spots on each side. Femora and tibiae with many dark spots of nearly uniform size.

Spiracles concolorous with surrounding surface. Narrow black border on lateral margins of abdomen interrupted broadly at middle



FIGS. 10–17. *E. acutus*. Fig. 10. Head and pronotum. Fig. 11. Posterior margin of pygophore, caudal aspect. Fig. 12. Pygophore, ventral aspect. Fig. 13. Posterior margin of pygophore, dorsal aspect. Fig. 14. Theca and related structures, lateral aspect; thecal processes (tp). Fig. 15. Theca and related structures, dorsal aspect; median penal lobes (mpl), penisfilum (p), thecal processes (tp). Fig. 16. Right paramere, lateral aspect. Fig. 17. Proctiger. Dimensional lines equal 0.5 mm.

of each segment, narrowly at obtuse apical angle; each sternite broader at apex than base of following sternite, producing serrate lateral abdominal margins.

Dorsal margin of pygophore with broad, deep, sinuous emargination in caudal view (Fig. 11); pygophore short in ventral view, emargination broad, sinuous, deep (Fig. 12); posterior margin sinuous in dorsal view with moderately deep, mesial, concave emargination (Fig. 13). Superior ridge not produced posteriorly above proctiger. Theca lacking lobes (Figs. 14, 15); thecal processes widely separated at base, compressed. Penisfilum emerging mesially, lying in trough formed by median penal lobes. Conjunctiva without appendages. Lateral apical surface of parameres large, smooth, flattened (Fig. 16). Dorsolateral tubercles of proctiger nearer base than apex, an elongate mesial impression passing between them (Fig. 17).

TYPE: Female, in British Museum (Natural History), London. Type examined.

DISTRIBUTION: From northern Brazil, Bolivia and Peru northward in South America and Trinidad.

COMMENT: This rather small species is distinguished by the convergent juga and acute humeral angles that are neither notably elevated nor turned forward. Characteristically the dorsum is very dark with scattered, pale, subcalloused spots and the venter quite pale, often strongly tinted with orange. The contrasting coloration is striking.

11, 3

Euschistus agudus, new species

F. 18–

Dorsum yellowish brown with humeri black; denticles on anterolateral pronotal margin, apex of scutellum pale yellow; punctation uniform, black. Ventral surfaces including punctation and legs, sordid yellow, dull. Length without membranes 9.9–11.3 mm.

Head slightly longer than broad across eyes, 2.0 mm. wide. Juga a little shorter than tylus; lateral margins very narrowly bordered with black, not parallel. Antennae sordid yellow, immaculate; length of segments 0.6–0.7; 1.0–1.1; 1.5–1.7; 1.6–1.7; 1.5–1.8 mm. Bucculae obtusely toothed anteriorly, evanescent at base of head, subequal in length to basal segment of rostrum.

Pronotum 2.4–2.7 mm. long at meson, 2.8–3.4 times as wide at humeri. Humeral angles acute to spinose, strongly produced, apex elevated well above disk (Figs. 18, 19); denticulate portion of anterolateral margins concavely arcuate, extending about two-thirds distance from apex to humeral angles.

Scutellum as long as wide, 3.5–3.9 mm. wide; small fovea composed of several black punctures in each basal angle; apex impunctate. Membrane of hemelytra slightly brownish; veins sparsely reticulate. Abdominal tergites black. Connexiva black, broadly alternated with yellow at middle of each segment, narrowly so at sutures between segments; punctures moderately large, dense, pale.

Pleural surfaces marked on each side with five small dots. Humeral angles bordered beneath with black. Small dark dots on femora and tibiae most numerous toward apex of femora and base of tibiae. Lateral margins of abdominal sternites dotted with black at basal angles, minutely so at apical angles; spiracles concolorous with sternites.

Concave, moderately deep emargination occupies about one-half breadth of dorsal margin of pygophore in caudal aspect (Fig. 20); outline of pygophore transversely oval in ventral view excepting very shallow broad mesial concavity of posterior margin (Fig. 21); in dorsal view posterior margin evenly rounded (Fig. 22); lateral walls of genital cup each bear small black tubercle anterolaterad of parameres; black carina branching from inferior ridge passes laterad of parameres. Inferior ridge partially outlines keystone shaped impression. Superior ridge moderately produced caudad above proctiger, with mesial emargination narrow, round. Small anterolateral appendage on each side of conjunctiva hyaline; apex of larger posterolateral appendage acute, sclerotized (Fig. 23). Penisfilum lacks apparent sclerotized cap at base. Lateral lobes of theca prominent, extending posteriorly beyond median lobe (Fig. 24). Lateral surfaces of parameres shallowly cupped; apex broadly rounded (Fig. 25). Tubercles on proctiger preapical, not prominent (Fig. 26).

HOLOTYPE: Male, labeled (a) Bogota, Colombia VIII-7-1925, M. H. Nicefero, (b) J. C. Lutz Collection, 1961. Segments IV and V of left antenna, segment V of right antenna missing. Type no. 72121, U. S National Museum.

PARATYPES: 3 ♂♂, 3 ♀♀: COLOMBIA: (a) Bogota (b) Lindig (c) type (d) allotype (e) 19371 (f) Riksmuseum Stockholm, one of four specimens apparently comprising the syntypic series of *Euschistus trisinuatus* Stål, 1872 (♀ NR)[1]; same data as holotype (♀ LHR). PANAMA: Hassler Exped. (♂ LHR). VENEZUELA: Maracay, 3/7/33, L. Martorel (♀ USNM) (a) El Pilar (b) H. E. Summers (♂ AMNH). WEST INDIES: (♂ TAMU).

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[1] Repositories of paratypes are indicated as follows: American Museum of Natural History (AMNH); British Museum (Natural History) (BMNH); California Academy of Sciences (CAS); Museu Rio-Grandense de Ciências Naturais, Pôrto Alegre (ICN); author's collection (LHR); Louisiana State University (LSU); Museum für Naturkunde an der Humboldt-Universitat zu Berlin (MHB); Michigan State University (MSU); Naturhistorisches Museum Wien (NMW); Naturhistoriska Riksmuseum, Stockholm (NR); Ohio State University (OSU); Texas A&M University (TAMU); United States National Museum (USNM); Universitetets Zoologiske Museum, Copenhagen (UZM); Universidad Nacional de la Plata (UNLP).

DISTRIBUTION: Panama, Colombia, Venezuela, and West Indies. The distribution suggests that the West Indian specimen is probably from Trinidad.

COMMENT: This species resembles *E. heros* but differs especially in lacking contrastingly dark intersegmental membranes on the abdominal venter.

Euschistus atrox (Westwood), 1837

Pentatoma atrox [Westwood], 1837, p. 40.
Euschistus atrox: Dallas, 1851, p. 204.
Euschistus trisinuatus Stål, 1872, p. 27. **New Synonymy.**

Yellowish brown above and beneath; punctation uniform, castaneous on dorsum, light castaneous to black on ventral surfaces including evaporative areas, finer and denser on abdomen. Length without membrane 8.8–10.7 mm.

Head slightly longer than width across eyes, 1.9–2.1 mm. wide. Tylus slightly exceeding juga; lateral margins of juga subparallel for middle one-third of distance from eyes to narrowly rounded apex of head. Antennae reddish yellow to deep pink, immaculate; length of segments 0.6–0.7; 0.9–1.1; 1.2–1.6; 1.5–1.9; 1.4–1.7 mm. Bucculae slightly longer than basal segment of rostrum.

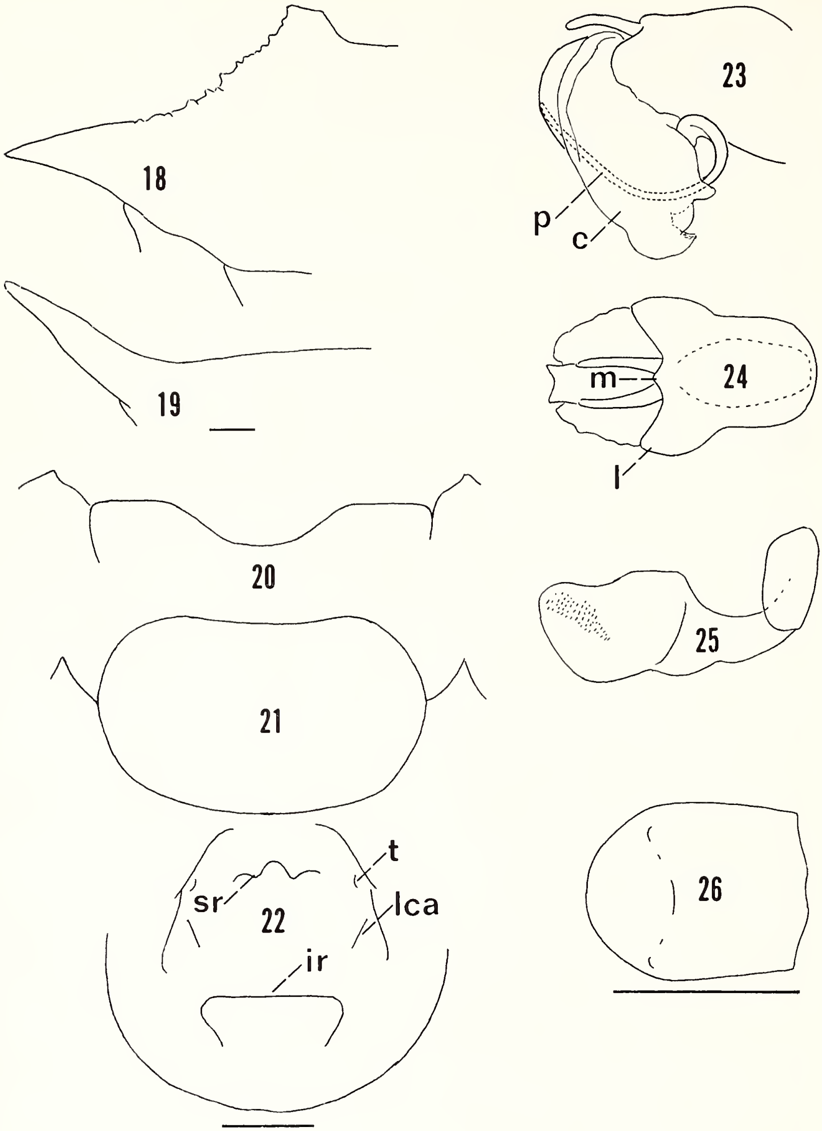
Pronotum 2.2–2.6 mm. long at meson, 2.5–3.0 times as wide at humeri. Anterolateral margins closely denticulate, nearly straight from apex to base of humeri (Fig. 27); denticles concolorous with disk. Humeri acutely produced, usually spinose, black, decidedly elevated and turned cephalad.

Scutellum slightly longer than width at base, 3.1–3.8 mm. wide, with small black fovea in each basal angle; apex punctate. Connexiva narrowly exposed, castaneous, clearly to obscurely relieved by pale spot in middle of each segment, sometimes with narrow black border interrupted at this spot; punctation dense, coarse, pale. Membranes of hemelytra transparent; veins brown, simple or furcate.

Pleural surfaces of thorax marked with five black spots on each side, these sometimes obscure. Legs nearly concolorous with antennae; all of femora and base of tibiae with small darker dots.

Mesial vitta on abdomen poorly defined, incomplete, sometimes much reduced or absent. Outer circumference of spiracular peritremes black, sometimes narrowly so. Black spot at basal angles of abdominal segments.

Posterior margin of pygophore trisinuately emarginate in caudal, ventral and dorsal views (Figs. 28, 29, 30). Tubercles of proctiger preapical, rather prominent. One conjunctival appendage on each



FIGS. 18–26. *E. agudus.* Fig. 18. Pronotum. Fig. 19. Dorsal profile of pronotum, cephalic aspect. Fig. 20. Posterior margin of pygophore, caudal aspect. Fig. 21. Pygophore, ventral aspect. Fig. 22. Genital cup, dorsal aspect, omitting parameres and proctiger; posterior margin of inferior ridge (ir), lateral carina (lca), tubercle (t), posterior

side sclerotized apically, a much smaller hyaline appendage usually discernible ventrad of large appendage. Sclerotized cap present at base of penisfilum (Fig. 32). Median lobe of theca extends farther posteriorly than lateral lobes (Fig. 33). Portion of paramere within genital cup bulbous, knobbed at apex (Fig. 34).

TYPE: Male, in Hope Department of Entomology, University Museum, Oxford. Type examined.

SYNONYMY: Four specimens in the Naturhistoriska Riksmuseum, Stockholm, that presumably comprise the syntypes of *Euschistus trisinuatus* Stål were examined. One of these four specimens, a female, is not conspecific with the other specimens. A lectotype and two paralectotypes are designated from the three remaining specimens.

Euschistus trisinuatus Stål, 1872, lectotype, male, labeled (a) Bogota (b) Lindig (c) ♂ (d) type (e) *trisinuatus* Stål (f) type (g) 19671 (h) Riksmuseum Stockholm; paralectotypes, two females, same data except (c) type (d) paratype and (e) 19371 and 19471.

The type of *Pentatoma atrox* and the lectotype and paralectotypes of *Euschistus trisinuatus* are so alike that Stål evidently had not seen Westwood's specimen, and understandably did not associate his own specimens with the too brief description, at the time he reviewed the genus and described *E. trisinuatus*.

DISTRIBUTION: *Guyana* (British Guiana), Colombia and Panama.

COMMENT: Most specimens of this species are distinctive because of the contrast between the black, acute or spinose humeri and light, yellowish brown of the remainder of the dorsum including the punctate apex of the scutellum. Specimens with the apex of the scutellum narrowly pale resemble *E. heros*, and those that are darkly discolored bear a likeness to *E. nicaraguensis*.

12,27 ♂

Euschistus bifibulus (Palisot de Beauvois), 1805

26 + 35 45

Pentatoma bifibula Palisot de Beauvois, 1805, p. 148, Hem. Pl. 10 fig. 5.
Euschistus pallipes Dallas, 1851, p. 204.
Euschistus bifibula: Dallas, 1851, p. 204.—Stål, 1862, p. 100.
Euschistus bifibulus: Stål, 1872, p. 27.

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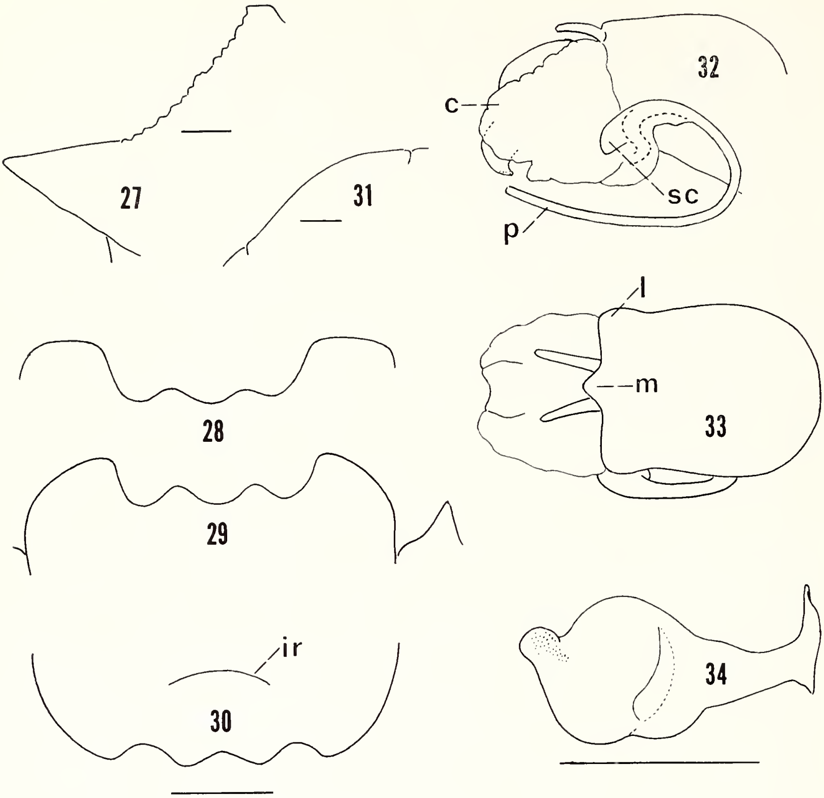
margin of superior ridge (sr). Fig. 23. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 24. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 25. Right paramere, lateral aspect. Fig. 26. Proctiger. Dimensional lines equal 0.5 mm.



FIGS. 27–34. *E. atrox.* Fig. 27. Pronotum. Fig. 28. Posterior margin of pygophore, caudal aspect. Fig. 29. Posterior margin of pygophore, ventral aspect. Fig. 30. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 31. Lateral profile of pronotal disk at meson. Fig. 32. Theca and related structures, lateral aspect; conjunctive (c), penisfilum (p), sclerotized cap (sc). Fig. 33. Theca and related structures, dorsal aspect; lateral lobes (1), median lobe (m). Fig. 34. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

Dorsum yellowish brown to pale castaneous; occasionally with few subcalloused lacunae or clusters of punctures on hemelytra, punctation otherwise uniform, moderately dense, castaneous to black. Ventral surfaces brownish yellow, concolorously punctate. Length of body 7.8–10.1 mm.

Width and length of head subequal, 1.6–2.1 mm. wide across eyes. Lateral margins tapering, apex rounded, juga and tylus subequal in length. Antennae brownish yellow to rufous, immaculate or with fine obscure brown dots on three basal segments; length of segments 0.4–0.6; 0.5–0.9; 0.9–1.3; 1.2–1.6; 1.1–1.5 mm. Bucculae equal to or slightly shorter than basal segment of rostrum.

Pronotum 2.0–2.6 mm. long at meson, 2.6–3.1 times as wide at humeri as long. Humeral angles acutely angulate to spinose, usually joined by inconspicuous wavering ruga (Figs. 35-37). Anterolateral margin concave, denticulate nearly to apex of humeri; denticles pale, small, conical, slightly inclined toward humeral angles, widely separated from one another.

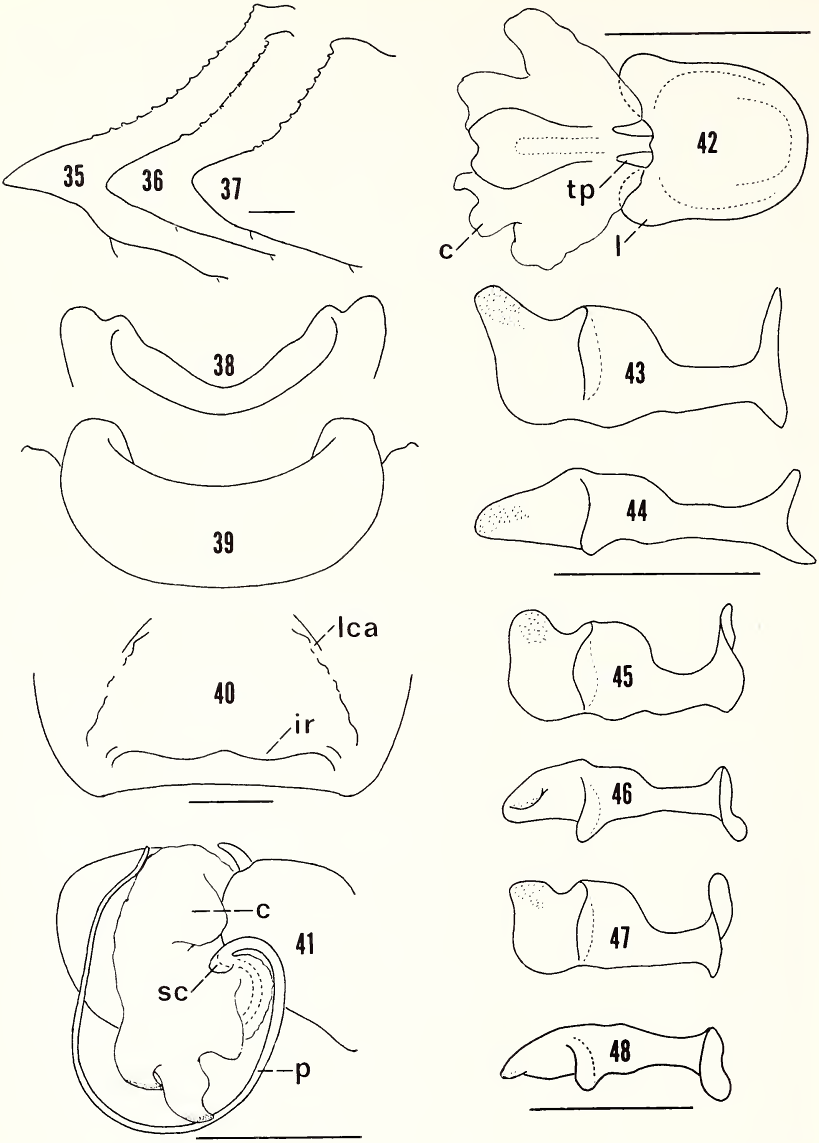
Length and breadth of scutellum subequal, 2.7–3.9 mm. wide at base; fovea at basal angles small or obscure; apex punctate, sometimes pale at very margin; disk usually uneven, rarely transversely rugose. Membrane of hemelytra fumose; veins simple or furcate. Connexiva fuscous along margin, fading mesad to castaneous, broadly interrupted at middle of each segment by brownish yellow spot; punctures pale, dense, somewhat coarse.

Pleural surfaces with five small black spots. Legs yellowish to brown, immaculate. Spiracles concolorous with sternites. Incisures spotted with black at basal angles, sometimes minutely so at apical angles.

Posterior margin of pygophore deeply and broadly concave in both caudal and ventral views (Figs. 38, 39); lateral margins at opening of genital cup bear black subvertical rugae posteriorly, these continuing cephalad on each side as carina on lateral walls (Fig. 40). Inferior ridge entirely visible in caudal view, forming anterior margin of shallow, submarginal sulcus. Superior ridge little produced, entire. Conjunctiva with three appendages on each side; anterior appendage large, hyaline, obtusely rounded apically; posterior appendages small, apex of each acute, sclerotized (Fig. 41). Penisfilum with sclerotized cap at base. Thecal processes very short; lateral lobes of theca produced posteriorly, little expanded laterally (Fig. 42). Basal margin of cupped portion of parameres nearly transverse in both lateral and cephalic aspects, moderately protruding in cephalic view (Figs. 43-48). Tubercles of proctiger preapical, joined by ridge arching anteriorly.

TYPE: Apparently lost. The type of *E. pallipes* Dallas, in the British Museum (Natural History), was seen.

DISTRIBUTION: From northern South America through Middle America to San Luis Potosí, Mexico, and through the West Indies to Cuba.



FIGS. 35–48. *E. bifibulus.* Figs. 35–37. Variation in humeral angles. Fig. 38. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 39. Pygophore, ventral aspect. Fig. 40. Genital cup, dorsal aspect, omitting parameres and proctiger; posterior margin of inferior ridge (ir), lateral carina (lca). Fig. 41. Theca

COMMENT: This species is remarkable for the variability of the parameres, the common form of which is represented in figures 45 and 46. *E. bifibulus* and *E. rugifer* Stål are similar in appearance and in the general form of the pygophore.

p. 71 **Euschistus biformis** Stål, 1862 -31 f 40-57

Euschistus biformis Stål, 1862, p. 100—Stål, 1872, p. 28.—Distant, 1880, p. 60, Pl. 5 fig. 15.
Euschistus capitatus Distant, 1890, p. 331 Pl. 31 fig. 10. **New Synonymy.**
Euschistus biformis nigrita Kirkaldy, 1909, p. 64 (as variety).

Dorsum pale yellowish brown to castaneous with few to many small calloused or subcalloused spots of same color or paler; punctation rather uniform, castaneous to black; melanistic form black, base of head and cicatrices castaneous. Ventral surfaces light yellow to flecked or solid red; punctation usually concolorous, rarely dark on thorax, then not on evaporative areas; melanistic form black, variably relieved with castaneous. Length without membrane 9.9–12.0 mm.

Width of head across eyes and length subequal, 2.1–2.4 mm. wide. Juga and tylus equally long, or juga exceeding tylus, leaving apex of head slightly incised; lateral jugal margins tapering from eyes to apex of head or subparallel for middle third of this distance. Basal three segments of antennae thickly dotted with black, entirely black excepting joints in melanistic form; apical two segments light brown to rufous, immaculate; length of segments 0.5–0.6; 0.8–1.1; 0.9–1.2; 1.2–1.5; 1.2–1.5 mm. Bucculae slightly longer than basal segment of rostrum.

Pronotum 2.1–2.5 mm. long at meson, 2.7–2.9 times as wide at humeri. Anterolateral margins closely denticulate about halfway from apex to maximum breadth of pronotum; denticles and disk concolorous, punctures often larger and darker at and on base of denticle than on disk. Humeral angles little produced and broadly rounded to moderately produced, spinose and black at apex (Figs. 49, 50). Disk

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and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 42. Theca and related structures, dorsal aspect; conjunctiva (c), lateral lobes (1), thecal processes (tp). Figs. 43–48. Variation in parameres; right paramere, lateral aspect (odd numbers), cephalic aspect (even numbers). Dimensional lines equal 0.5 mm.

with broad, shallow submarginal impression between each cicatrice and humerus.

Scutellum slightly longer than broad, rarely subequal, 3.5–4.0 mm. wide; small black fovea composed of several coarse punctures at basal angles; apex punctate. Connexiva black or blending mesad to castaneous, with large macula at middle of each segment yellow; punctation dense, moderately coarse. Membranes of hemelytra fuscous, veins simple or furcate.

Pleural surfaces of thorax with five black spots on each side. Legs brownish yellow, rather thickly strewn with dark spots of various sizes, these often noticeably clustered on anterior face of femora about three-fifths distance from base to apex; legs of melanistic form black, coxae and trochanters castaneous, tarsi brown. Basal angles of abdominal margin translucent and markings of connexiva visible from beneath. Spiracles black.

Dorsal margin of pygophore with broad emargination exposing mesial notch of inferior ridge in caudal view (Fig. 51); posterior margin in ventral view broadly rounded on each side of wide, shallow, sinuous concavity (Fig. 52); in dorsal view, mesial emargination shallow (Fig. 53). Posterior margin of inferior ridge slightly concave, produced posteriorly, overhanging part of excavation between base of ridge and posterior margin of pygophore. Superior ridge produced posteriorly above proctiger, with narrow, rounded, mesial notch. Conjunctiva with two appendages on each side, terminating in acute sclerotized apex (Fig. 54). Base of penisfilum with sclerotized cap. Lateral lobes of theca well developed, far surpassing median lobe posteriorly (Fig. 55). Apex of parameres digitiform, finely shagreened laterally (Fig. 56). Tubercles of proctiger preapical, prominent (Fig. 57).

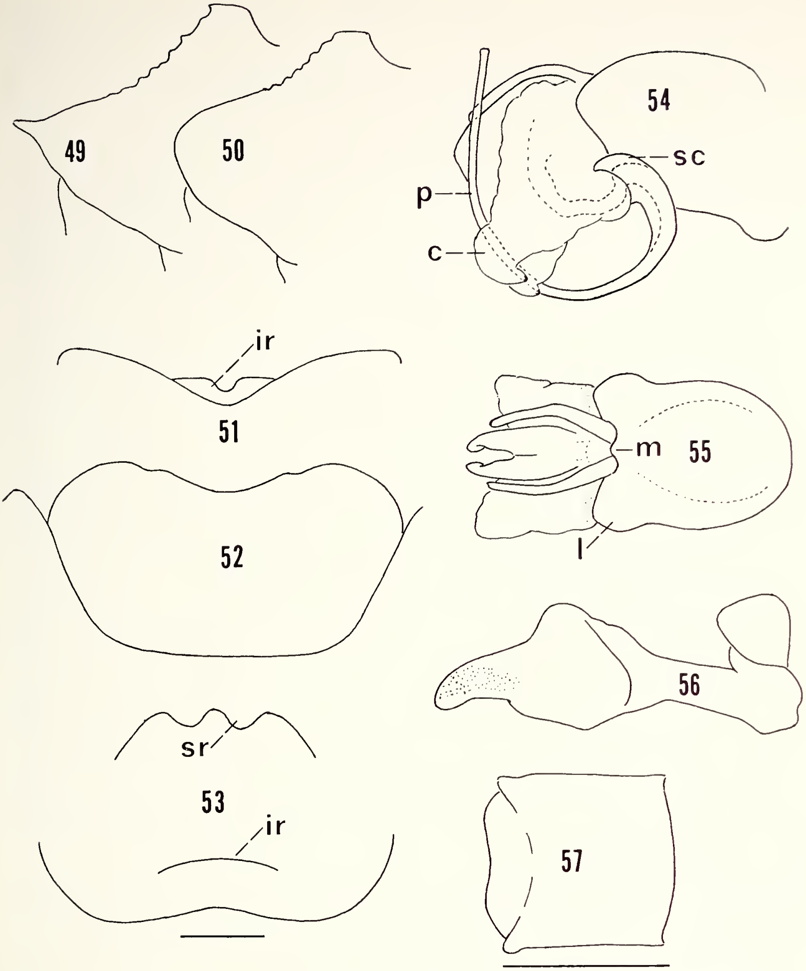
TYPE: Male, in Naturhistorisches Museum, Vienna, Austria. Not seen.

The type of *E. capitatus* Distant, in the British Museum (Natural History), was examined.

SYNONYMY: Distant emphasized that *Euschistus capitatus* is a large pentatomid with the juga clearly surpassing the tylus, and he compared his specimen to *E. servus euschistoides* (Vollenhoven) (= *E. fissilus Uhler*). The type specimen, a female, in the British Museum (Natural History) was examined and is a normal example of *E. biformis,* although near the upper limits for this species in size and in the degree to which the juga surpass the tylus.

DISTRIBUTION: Panama to southwestern United States.

COMMENT: This abundant species is one of the most variable of



Figs. 49–57. *E. biformis*. Figs. 49–50. Variation in humeral angles. Fig. 51. Posterior margin of pygophore, caudal aspect; inferior ridge (ir). Fig. 52. Pygophore, ventral aspect. Fig. 53. Genital cup, dorsal aspect, omitting parameres and proctiger; posterior margin of inferior ridge (ir) and superior ridge (sr). Fig. 54. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 55. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 56. Right paramere, lateral aspect. Fig. 57. Proctiger. Dimensional lines equal 0.5 mm.

the genus in coloration. Inconsistency in the form of the humeral angles undoubtedly suggested the trivial name, but the length of the juga relative to the tylus also varies notably, the three lobes being equally long or the juga plainly surpassing the tylus.

Euschistus chiapus, new species -32

f. 58-66

Dorsum light to dark brown, uniformly and rather densely punctate with castaneous to black; apex of scutellum ivory, impunctate. Ventral surfaces yellowish brown, concolorously punctate. Length without membrane 9.4–11.0 mm.

Head slightly broader across eyes than long, 2.1–2.4 mm. wide, 2.0–2.3 mm. long. Lateral margin of juga subparallel to gently convergent for middle third of distance from eyes to evenly rounded apex of head. Basal three segments of antennae inconsistently marked: basal segment dotted with red or fuscous; fuscous dots, streaks and apical ring appearing singly or in combinations on following two segments; last two segments fuscous excepting yellowish brown ring on basal quarter of each; length of segments 0.6–0.7; 0.9–1.1; 1.3–1.6; 1.6–1.8; 1.6–1.7 mm.; each antenna about one-fifth longer than twice width of head across eyes. Bucculae obtusely lobed anteriorly, evanescent at base of head, a little shorter than basal segment of rostrum.

Pronotum 2.4–2.6 mm. long at meson, 2.5–2.6 times as wide at humeri. Anterolateral margins straight or nearly so; apical third or less rugosely undulating or armed with low, obtusely angular denticles or serrations; narrowly impunctate and pale from apex to near humeri (Figs. 58-59). Humeral angles modestly produced, obtusely rounded.

Scutellum about as broad as long, 3.7–3.9 mm. wide at base; small black fovea at basal angles composed of several punctures; apex pale, impunctate. Connexiva black, middle of each segment occupied by large semicircular pale spot arching mesad from lateral margin; punctation dense, coarse, shallow. Membrane of hemelytra dark, transparent; veins simple or furcate.

Thorax marked on each side with five black spots on pleural surfaces, spot at anterolateral angles of prothorax small, others large; prosternum black between coxae; mesosternum maculated with black before each coxa. Legs a little darker than pleural surfaces; femora with several black spots, tibiae immaculate or with dark dots. Diffuse dark mesial macula on one to four abdominal sternites; lateral margins of abdomen plainly marked with black at both basal and apical angles of sternites. Spiracles concolorous with surrounding surface.

Posterior margin of pygophore with broad, deep, slightly sinuous emargination (Fig. 60); posterior margin nearly flat mesially, broadly lobed on each side from both ventral and dorsal aspects (Figs. 61, 62); lateral carina on each side of genital cup rugose posteriorly, becoming denticulate anteriorly. Superior ridge produced posteriorly above proctiger, notched mesially. Two small appendages on each side of conjunctiva, both acute, sclerotized at apex (Fig. 63). Penisfilum without apparent cap at base. Lateral lobes of theca well developed (Fig. 64). Tubercles of proctiger preapical (Fig. 66).

HOLOTYPE: Male (a) Ocozocoautla 12 mi. W. Chiapas, Mexico VII-26-52 (b) E. E. Gilbert, C. D. MacNeil, Collectors. Deposited in American Museum of Natural History.

PARATYPES: 3 ♂♂, 1 ♀. GUATEMALA: Chiquimula, Chiq., 1000 ft. VII-21-1947 (♂ LHR). MEXICO: same data as holotype (♀ AMNH; ♂ USNM); Oaxaca, 32.8 mi. NW Jalapa del Marques. July 13, 1972, Clark, Murray, Hart, Schaffner (♂ TAMU).

DISTRIBUTION: Guatemala and the Mexican state of Chiapas.

COMMENT: This species resembles *E. biformis* in size and general appearance but is at once separated by the pale, basal rings of the last two segments of the antennae, the pale impunctuate apex of the scutellum, and feeble denticulation of the anterolateral pronotal margins.

10

Euschistus comptus Walker, 1868

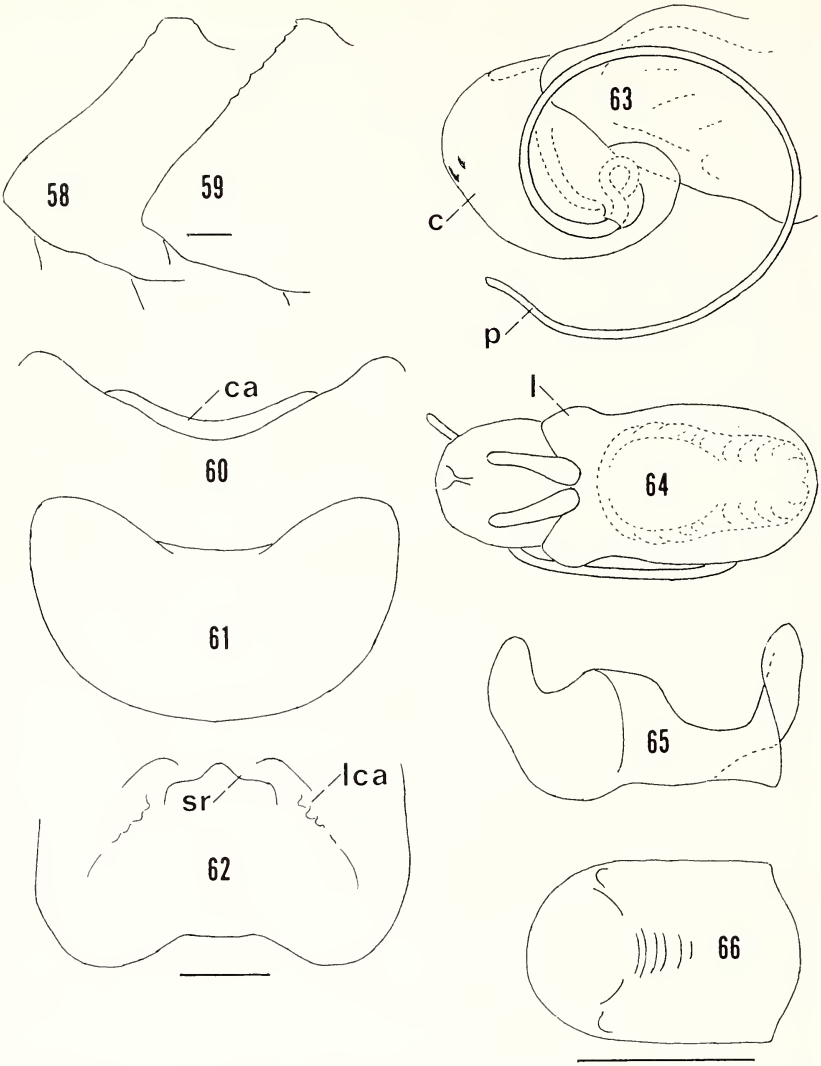
12-77

Euschistus comptus Walker, 1868, p. 550.—Stål, 1872, p. 28.—Distant, 1880, p. 60, Pl. 6 fig. 11.

Yellowish brown, punctured with black above and beneath. Length without membranes 10.5–11.4 mm.

Width of head across eyes and length subequal, 2.2–2.3 mm. wide. Lateral margins of juga tapering from eyes to broadly rounded apex; tylus depressed toward apex, margins here overlapped by juga; base of tylus and vertex behind tylus sparsely punctate. Basal segment of antennae dotted with fuscous, remaining segments rufous, immaculate; length of segments 0.6; 0.8–0.9; 1.1–1.2; 1.2; 1.2–1.4 mm. Bucculae subequal in length to basal segment of rostrum.

Pronotum 2.8–3.1 mm. long at meson, 2.4–2.6 times as wide at humeri as long; anterolateral margins shallowly concave from apex to humeral angles, closely denticulate for about three-fourths distance from apex (Fig. 67); humeral angles little produced, acutely angular,



FIGS. 58–66. *E. chiapus.* Figs. 58–59. Variation in denticulation of anterolateral margin of pronotum. Fig. 60. Posterior margin of pygophore, caudal aspect; carina (ca). Fig. 61. Pygophore, ventral aspect. Fig. 62. Genital cup, dorsal aspect, omitting parameres and proctiger; lateral carina (lca), superior ridge (sr). Fig. 63. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 64. Theca and related structures, dorsal aspect; lateral lobes (l). Fig. 65. Right paramere, lateral aspect. Fig. 66. Proctiger. Dimensional lines equal 0.5 mm.

joined by conspicuous impunctate fascia, densely punctate behind fascia.

Scutellum as long as broad 3.8–4.4 mm. at base; disk unevenly punctate, fovea at basal angles obscure; apex punctate. Membrane of hemelytra hyaline, usually with some small dark inconspicuous spots; venation simple, fuscous. Connexiva weakly alternated, black along margin, fading mesad to castaneous; pale subcircular spot centered in each segment; punctation dense, coarse, shallow, pale.

Evaporative areas punctured with black. Femora thickly dotted with black; tibiae immaculate or nearly so. Spiracles and lateral margins of abdomen pale yellow, latter calloused, immaculate at incisures; apical borders of some or all sternites often adorned with bright impunctate irregularly shaped lacunae.

Posterior margin of pygophore broadly and deeply emarginated; bottom of emargination rounded in caudal view, exposing inferior ridge (Fig. 68), imperfectly rounded in ventral view, partially exposing inferior ridge (Fig. 69), flat in dorsal view (Fig. 70). Inferior ridge and bottom of emargination separated by narrow sulcus. Superior ridge little produced posteriorly above proctiger, roundly notched at meson. Two appendages on each side of conjunctiva, both partially sclerotized, acute apically (Fig. 71). Penisfilum emerges mesially, with small sclerotized cap at base. Lateral lobes of theca well developed (Fig. 72). Parameres terminate in simple hook (Fig. 73). Tubercles of proctiger subapical.

TYPE: Male, in British Museum (Natural History), London. Type examined.

DISTRIBUTION: Guatemala northward to Nayarit, Mexico.

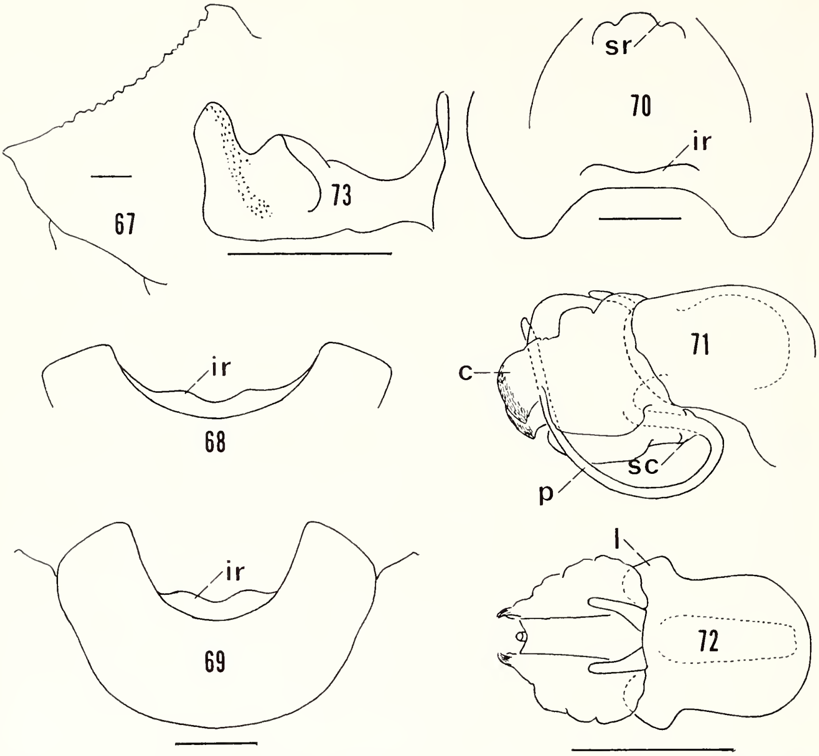
COMMENT: The subcalloused form of the lateral margins of the abdomen separate this species from *E. comptus*, which it closely resembles.

Euschistus crassus Dallas, 1851

Euschistus crassus Dallas, 1851, p. 205.—Barber, 1914, p. 522.—Blatchley, 1926, p. 141.

Sordid white to yellow brown, rather sparsely and unevenly punctate above and beneath with rufous to black, overall effect gray to light tan. Length without membrane 9.7–12.2 mm.

Width of head through eyes subequal to length, 2.1–2.5 mm. wide. Juga nearly as long as tylus, lateral margins subparallel for middle third of distance from eyes to apex of head. Antennae sordid white to rufous, basal segment finely dotted, remaining segments im-



FIGS. 67–73. *E. comptus*. Fig. 67. Pronotum. Fig. 68. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 69. Pygophore, ventral aspect; inferior ridge (ir). Fig. 70. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), superior ridge (sr). Fig. 71. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 72. Theca and related structures, dorsal aspect; lateral lobes (l). Fig. 73. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

maculate, last two often a little darker; length of segments 0.6–0.7; 0.9–1.2; 1.2–1.6; 1.3–1.5; 1.2–1.6 mm. Bucculae as long as or slightly shorter than basal segment of rostrum.

Pronotum 2.5–3.3 mm. long at meson, 2.3–2.5 times as wide at humeri; anterolateral margins unevenly and shallowly concave from above, rounded, vertically rugose and denticulate; denticles few, angular, discrete, or numerous with some irregular or confluent (Figs.

73, 74); humeral angles modestly produced, usually acutely toothed, rarely obtusely rounded; humeri joined by narrow impunctate calloused fascia.

Scutellum as long as broad, 3.6–4.7 mm. wide at base; basal angles lacking fovea; apex broadly rounded, punctate along meson, usually impunctate and often paler on each side. Membrane of hemelytra vitreous to milky with numerous small brown dots; veins concolorous with spots, simple or furcate. Connexiva narrowly exposed, fuscous, alternated with pale spot at middle and at base of each segment; punctures dense, coarse, pale.

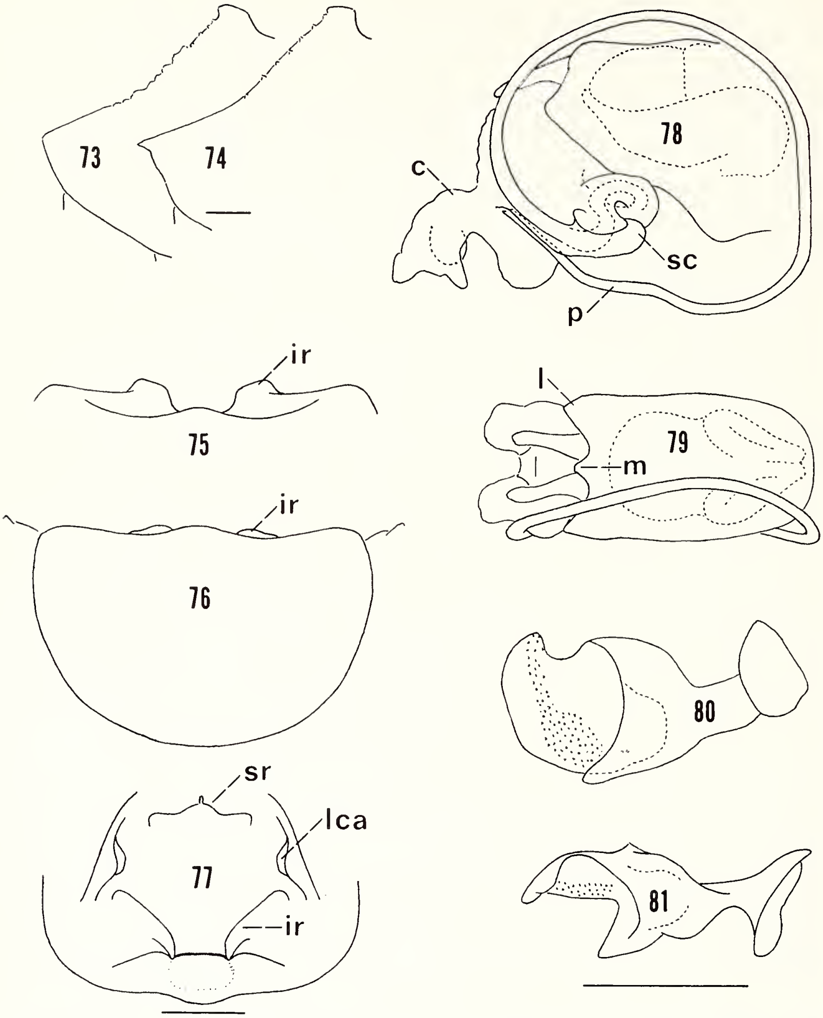
Evaporative areas punctate with black. Dots on femora and tibiae dense, fine. Abdominal venter finely punctate, sparsely so mesially, most coarsely as vitta mesad of spiracular line on each side; dark punctures sometimes confined to vittae. Spiracles concolorous with supporting sclerites. Apical angles of abdominal sternites somewhat produced, obtuse; incisures along lateral margins immaculate or spotted with black.

Posterior margin of pygophore concavely depressed on each side of mesial convexity in both caudal and ventral views; ventral surface of pygophore nearly semicircular; in dorsal view, posterior margin of pygophore and inferior ridge separated by transversely oval mesial pit. Thin black lateral carina traverses lateral walls diagonally, directed dorsad and cephalad from depth of genital cup, at anterior limit of tumescence on lateral walls. Inferior ridge largely exposed in caudal view, almost hidden in ventral view (Figs. 75, 76), triangularly tumid on each side, with acutely toothed mesial angle elevated above and projecting over mesial pit (Fig. 77). Superior ridge slotted along meson at base of concave emargination. Apical margin of parameres flattened in lateral view (Fig. 80), deeply incised and cupped in cephalic view (Fig. 81). Proctiger abruptly deflected subapically, without tubercles. Appendage of conjunctiva trifurcate (Fig. 78). Penisfilum with sclerotized cap at base. Theca elongate, lobes well developed; lateral lobes surpassing median lobe, not laterally expanded (Fig. 79).

TYPE: Male, in British Museum (Natural History), London.

DISTRIBUTION: Coastal plains of southern United States, Cuba, Hispaniola, and possibly into Mexico.

COMMENT: West Indian specimens of this species are smaller, 7.6–8.0 mm. in length, than those from west of the Mississippi River and differ subtly in the structure of the parameres and genital cup. Intermediate forms occur commonly in southeastern United States.



FIGS. 73–81. *E. crassus*. Figs. 73–74. Variation in humeral angle and denticulation. Fig. 75. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 76. Pygophore, ventral aspect, inferior ridge (ir). Fig. 77. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), lateral carina (lca), superior ridge (sr). Fig. 78. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 79. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 80. Right paramere, lateral aspect. Fig. 81. Right paramere, cephalic aspect. Dimensional lines equal 0.5 mm.

CRENATOR GROUP

The species and subspecies of the crenator group (*Euschistus crenator crenator, E. crenator orbiculator*, and *E. quadrator*) are clearly united by the structure of the male genitalia and other characters. Middle American congeners most similar in size and appearance are *E. emoorei, E. vetus* and the four species of the *sulcacitus* group. The male genitalia permit unequivocal separation of all these species and placement of most specimens of *E. crenator* into one or the other of the two subspecies. The females, however, form a complex that is only partially resolved at present.

GROUP CHARACTERISTICS

Length of males 8.4–10.8 mm., width at humeri 5.2–7.0 mm. Dorsum light brown, rarely suffused with red, often black at humeri and along anterolateral margin of pronotum; punctation somewhat uneven, usually leaving several small lacunae on hemelytra, often on scutellum, occasionally on pronotum, and frequently suggesting transverse impunctate fascia between humeri; without calloused spots or conspicuous clustering of punctures; punctures castaneous to black, nearly always black and crowded along anterolateral pronotal margins, at least toward apex. Ventral surfaces pale brownish yellow, sometimes flecked with red; punctures concolorous with surface.

Length of head and width through eyes subequal, 1.9–2.1 mm. wide. Lateral jugal margins sigmoid from eyes to rounded apex of head, subparallel or narrowing slightly toward apex for middle third of this distance. Tylus subequal to juga in length. Antennae as dark as dorsal surface of head to as pale as ventral surface; last two segments, excepting base of each, darkest; basal segment nearly attaining apex of head, sometimes sparsely ornated with dark dots; length of segments 0.5–0.6; 0.8–1.2; 1.0–1.5; 1.2–1.7; 1.3–1.7 mm. Bucculae obtusely toothed anteriorly, more or less percurrent caudad of tooth, evanescent at base of head. First rostral segment subequal to bucculae in length.

Pronotum 2.0–2.6 mm. long at meson, width at humeri 2.4–3.0 times length. Anterolateral margins closely denticulate for about two-thirds distance from apical to humeral angles, concave along denticulate portion; denticles light brownish yellow to black; punctures usually darkest and most crowded along denticulate margin nearest apex of pronotum, a few punctures encroaching among and onto base of denticles. Humeri moderately produced, obtusely rounded to spinose, usually entirely black and elevated when acutely angular or spinose (Figs. 82, 83). Pronotal disk conspicuously impressed only on apical submargin; cicatrices little elevated.

Breadth and length of scutellum subequal, 3.0–3.8 mm. long; margin of apex often narrowly pale with few or no punctures. Membrane of hemelytra nearly colorless, darker venation simple to sparingly reticulate. Punctures on connexiva coarse, thick, shallow, pale; margin black to castaneous, broadly interrupted in middle of each segment with pale yellow.

Thorax with five black spots on each side. Evaporative areas matte, nearly concolorous with adjacent surfaces. Femora and tibiae dappled with dark spots of various sizes, often and obscurely so in *E. crenator*. Spiracles concolorous with supporting sclerites. Anterolateral angles of each segment embrace small black dot; posterolateral angles usually black at very apex.

Pygophore slightly concave in lateral profile; viewed dorsally, inferior ridge defines anterior and lateral margins of transverse oval or reniform impression, this impression indistinctly separated posteriorly from excavated area continuing to posterior margin of genital cup (Figs. 88, 98, 106); small black tubercle situated anterolaterad of parameres on lateral walls. Superior ridge produced posteriorly, notched mesially (Fig. 89). Small dorsolateral preapical tubercle on each side of proctiger (Fig. 93). Conjunctiva bears two small appendages on each side; posterolateral appendage heavily sclerotized apically; anterolateral appendage seldom pigmented, then only lightly at apex (Figs. 91, 101, 110). Base of penisfilum without conspicuous sclerotized cap. Lateral lobes of theca expanded both laterally and posteriorly, giving theca shape of bell in dorsal aspect; median lobe small but obvious.

Euschistus crenator crenator (Fabricius), 1794

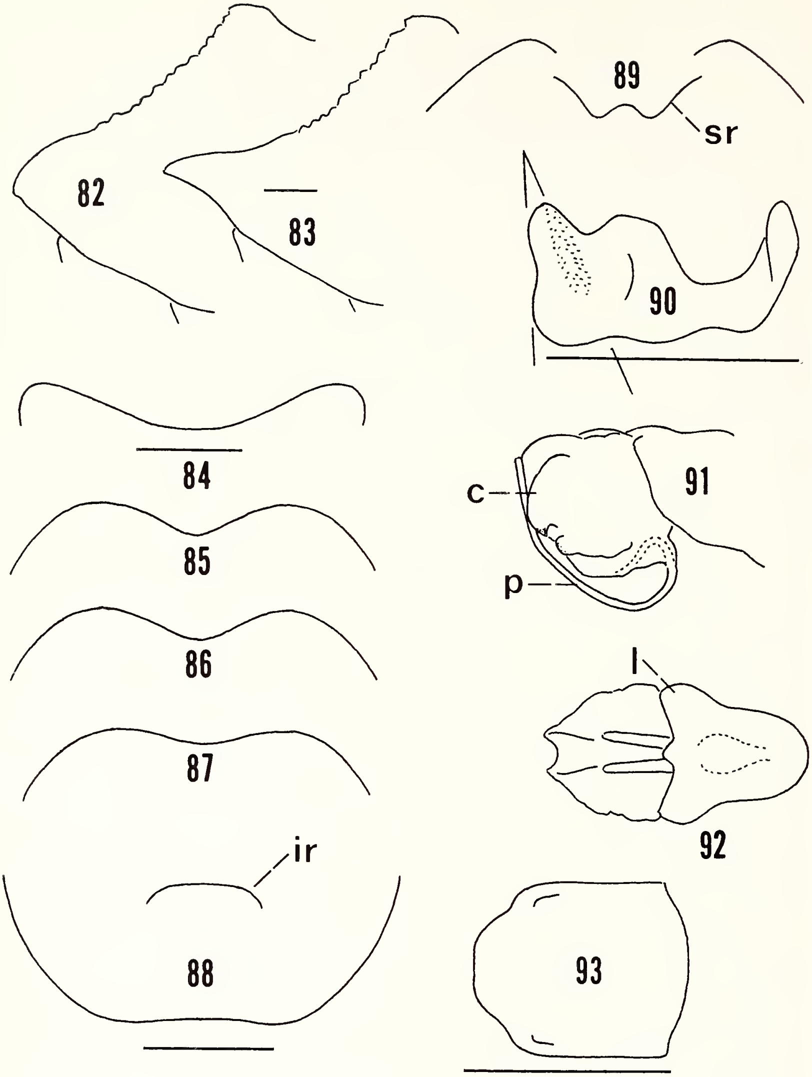
Cimex crenator Fabricius, 1794, p. 101.
Pentatoma obscura Palisot de Beauvois, 1805, p. 149, Hem. Pl. 10 fig. 7 (♂).
Pentatoma pustulata Palisot de Beauvois, 1805, p. 185, Hem. Pl. 11 fig. 2.
Pentatoma crocipes [Westwood], 1837, p. 40. **New Synonymy.**
Euschistus obscurus Dallas, 1851, p. 208.
Euschistus proximus Dallas, 1851, p. 208. **New Synonymy.**
Euschistus reductus Walker, 1867, p. 246. **New Synonymy.**
Euschistus conterminus Walker, 1867, p. 248.
Mormidea melanocantha Walker, 1868, p. 552.
Euschistus crenator: Stål, 1868, p. 26 (redescription of type).—Stål, 1872, p. 27 (in part).

Posterior margin of pygophore with broad, mesial concavity in caudal view (Fig. 84), sinuate in ventral view with mesial concavity moderately broad, shallow to moderately deep (Figs. 85-87), rounded in dorsal view but broadly shallowly concave at apex (Fig. 88). Shagreened surface of parameres elongate, extending about three-fourths distance across parameres, its longitudinal axis diverging about 20° from line along apical margin of parameres (Fig. 90).

TYPE: Male, from St. Thomas Island, Virgin Islands, West Indies. In Universitetets Zoologiske Museum, Copenhagen, Denmark.

SYNONYMY: The variability of this species in color, punctation, size, and to a lesser degree in the form of the pygophore, no doubt accounts for the large number of junior synonyms attributable to it. The holotype of *Cimex crenator* Fabricius was loaned by the Universitetets Zoologiske Museum, Copenhagen, for examination and dissection, and the British Museum (Natural History) made available the holotypes, all males, of *Euschistus obscurus* Dallas, *E. proximus* Dallas, and *E. reductus* Walker. Differences among these four types consist of trivial variations in color, punctation, size, venation, acuteness of the humeral angles and depth to which the posterior margin of the pygophore is emarginate. All variations from the type of *Cimex crenator* are well within the range observed for this species. The holotypes, both males, of *Pentatoma crocipes* [Westwood], in the Hope Department of Entomology, Oxford, and *Euschistus conterminus* Walker in the British Museum (Natural History) were examined by Drs. I. Lansbury and W. R. Dolling, respectively, and judged by them not to differ significantly from the material sent to them for comparison. The holotype of *Mormidea melanocantha* Walker, also in the British Museum (Natural History), is a female from Hispaniola (St. Domingo). The status of this name as a junior synonym is presumed from the type locality to be correct. Palisot de Beauvois' specimens, also from Hispaniola, cannot be located in the Museum National d'Histoire Naturelle in Paris and presumably are lost. I have followed Stål (1868) in citing *Pentatoma obscura* (♂) and *P. pustulata* as junior synonyms.

DISTRIBUTION: From Peru and Brazil (Bahia) through the West Indies. Forms intermediate between the nominate subspecies and *E. crenator orbiculator* occur in Colombia and Ecuador. One male from the Canal Zone, Panama, and two from British Honduras having the characters of the nominate subspecies were examined. The latter specimens are probably mislabeled or adventitious.



Figs. 82–93. *E. crenator crenator.* Figs. 82–83. Variation in humeral angles. Fig. 84. Posterior margin of pygophore, caudal aspect. Figs. 85–87. Variation in posterior margin of pygophore, ventral aspect. Fig. 88. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 89. Superior ridge (sr). Fig. 90. Right paramere, lateral aspect. Fig. 91. Theca and related structures; conjunctiva (c), penisfilum (p). Fig. 92. Theca and related structures, dorsal aspect. Fig. 93. Proctiger. Dimensional lines equal 0.5 mm.

Euschistus crenator orbiculator, new subspecies

Posterior margin of pygophore with two intergrading forms. Commonly, broadly concave in caudal view (Fig. 94), rounded with narrow, shallow, mesial concavity in both ventral and dorsal views (Figs. 96, 98). Infrequently, shallowly concave and sinuous mesially in caudal view (Fig. 95), with moderately broad, very shallow, mesial concavity in both ventral and dorsal views (Figs. 97, 99). Longitudinal axis of elongate, shagreened surface of parameres inclined about 35° from line along apical margin (Fig. 100).

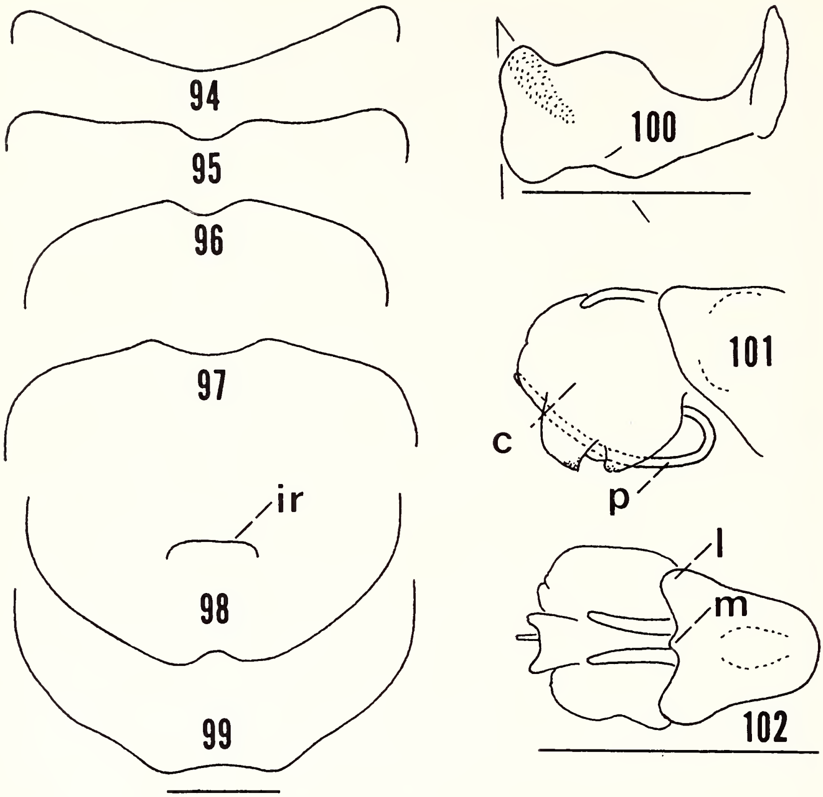
HOLOTYPE: male, labeled Las Nubes, Managua, Nicaragua 1-V-69. Weeds, Ev. Vogel, Coll. Type no. 72124, U. S. National Museum.

PARATYPES: 33 ♂♂. COSTA RICA: Piedra Blanca Bay, 11-6-38 (LSU). *El Salvador*: Quezaltepeque, 500 m. VI-19-63. (b) D. Q. Cavagnaro & M. E. Irwin (CAS). GUATEMALA: Zacapa, Zac., 600 ft. VII-19-1947. (b) C. & P. Vaurie (LSU); San Jose, VIII-20-1954. E. S. Ross (CAS). HONDURAS: Punta Castilla, J. Beard. IX/2 (AMNH). MEXICO: *Chiapas*: 31 mi. SE Comitan, VI-18-65. At light. Burke, Meyer, Schaffner (TAMU). *Colima*: Manzanillo, VII-18-1953 (b) C. & P. Vaurie (2 AMNH). *Nayarit*: 3 mi SE San Blas, VII-25-66. P. M. & P. K. Wagner (ICN). *San Luis Potosí*: El Salto, VI-5-1965. Burke, Meyer, Schaffner (BMNH). *Sinaloa*: Mazatlan, March 5, 1918. J. A. Kusche (2 CAS). *Tamaulipas*: 8 mi. W. El Limon, July 20, 1970. At light. Murray, Phelps, Hart, Schaffner (TAMU); 5 mi. SSE Gomez Farias, July 19–20, 1970. Murray, Phelps, Hart, Schaffner (2 TAMU). *Vera Cruz*: Papantla, 900 ft. Aug. 1, 1955. P. & C. Vaurie (AMNH); Llera, 7-20-54, R. R. Dreisbach (MSU); Vera Cruz, VIII/1-6/61. R. & K. Dreisbach (MSU). *Yucatan*: Valladolid, IX-13-1952. J. & D. Pallister (LHR); Chichen Itza, IX-14-1952. J. & D. Pallister (AMNH); same data except date, 7-19-1952 (AMNH). NICARAGUA: same data as holotype (BMNH, LHR, NMW, 2 NR, OSU, 2 USNM, 2 UZM). PANAMA: Barro Colorado, C. Z., III-22-1933. H. F. Schwarz (AMNH); Ft. Clayton, C. Z., XI-12-44. K. E. Frick (LHR).

DISTRIBUTION: From Ecuador and Colombia to the northern border of Mexico.

Euschistus quadrator, new species

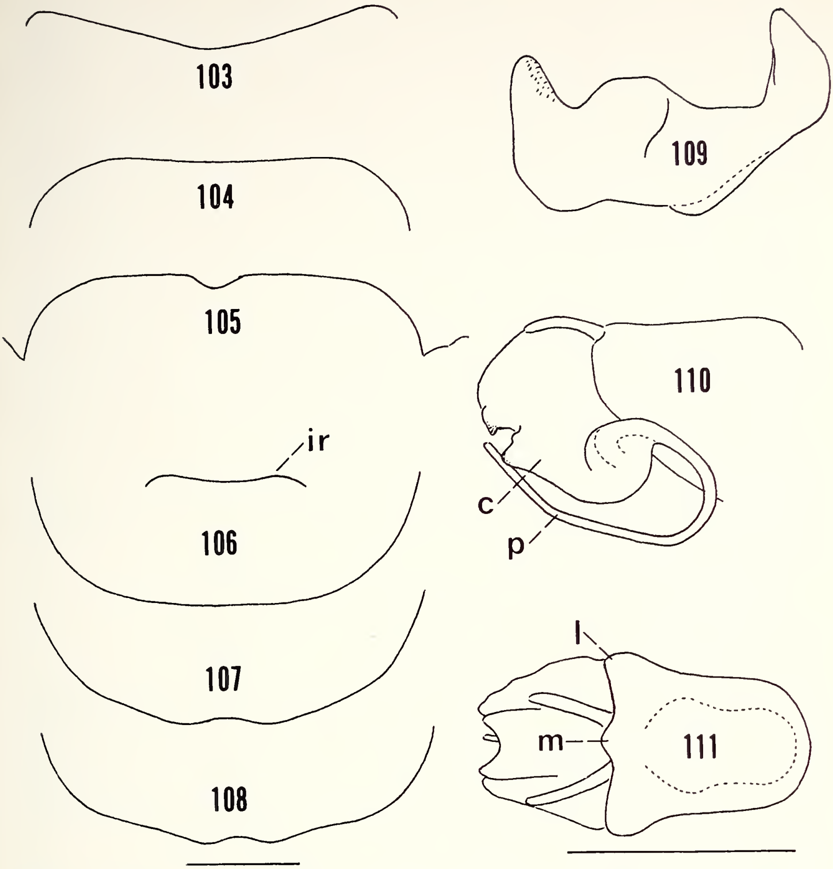
Posterior margin of pygophore broadly V shaped or concave in caudal view (Fig. 103), broadly truncate in ventral view (Fig. 104), usually with small, mesial notch (Fig. 105), rounded in dorsal view (Fig. 106), usually with shallow, narrow, mesial concavity (Fig.



FIGS. 94–102. *E. crenator orbiculator.* Figs. 94–95. Variation in posterior margin of pygophore, caudal aspect. Figs. 96–97. Variation in posterior margin of pygophore, ventral aspect. Figs. 98–99. Variation in posterior margin of pygophore, posterior margin of inferior ridge (ir), dorsal aspect. Fig. 100. Right paramere, lateral aspect. Fig. 101. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 102. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Dimensional lines equal 0.5 mm.

107), sometimes flattened on each side of this concavity (Fig. 108). Shagreened area of paramere short, extending little if any beyond base of notch in cephalic margin (Fig. 109).

HOLOTYPE: Male, labeled 10 mi. SE Monterrey, N. L., Mexico. 3000 ft. Night beating. VII-5-59. R. B. Selander & J. C. Schaffner. Type no. 72125, U. S. National Museum.



Figs. 103–111. *E. quadrator*. Fig. 103. Posterior margin of pygophore, caudal aspect. Figs. 104–105. Variation in posterior margin of pygophore, ventral aspect. Figs. 106–108. Variation in posterior margin of pygophore, inferior ridge (ir), dorsal aspect. Fig. 109. Right paramere, lateral aspect. Fig. 110. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 111. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Dimensional lines equal 0.5 mm.

Paratypes: 33 ♂♂. mexico: *Nuevo Leon*: same data as holotype (LHR); Pesqueria, VII-7-59. R. B. Selander & J. C. Schaffner (USNM). *San Luis Potosí*: 17 mi. N. Ciudad Valles, July 7, 1966. P. M. & P. K. Wagner (UZM). *Tamaulipas*: Victoria, V-22-1952 (b)

M. Cazier, W. Gertsch, R. Schrammel (2 AMNH); 5 mi. SSE Gomez Farias, July 19, 1970. At light. Schaffner, Hart, Murray, Phelps (TAMU). *Vera Cruz*: Tebanca, Lake Catemaco, VI-8-65 (LSU); Tuxpan, VI-6-65. At light. Burke, Meyer, Schaffner (NR). *Yucatan*: Cordeleria, Mayapan, Aug. 9, 1952. J. & D. Pallister (3 AMNH); same data except dates 7-27-1952, 8-3-1952, IX-8-1952, IX-8-1952 (4 AMNH); Merida, VI-27-1952. J. & D. Pallister (AMNH, BMNH, LHR, NR, UZM). U.S.A., *Louisiana*: Avoyelles Parish. 18-VII-1969 (LHR): *Texas, Cameron Co.*: Brownsville, VI-23-25-50. G. Linsley (2 CAS); 5 mi. W. Brownsville, June 22, 1969. Board & Hafernik, (LSU, USNM); same data except dates, June 14, 1969 (MSU) and June 15, 1969 (OSU). *Hidalgo Co.*: Bentsen Rio Grande State Park, June 18, 1969. Board & Hafernik (ICN, TAMU). *San Patricio Co.*: Welder Wildlife Ref., June 22, 1969. Board & Hafernik (NMW); Lake Corpus Christi State Park, June 9, 1969. Board & Hafernik (TAMU).

DISTRIBUTION: Apparently this species is confined to the coastal plains and bordering foothills from Yucatan, Mexico, into Louisiana, USA.

Euschistus emoorei Rolston, 1972

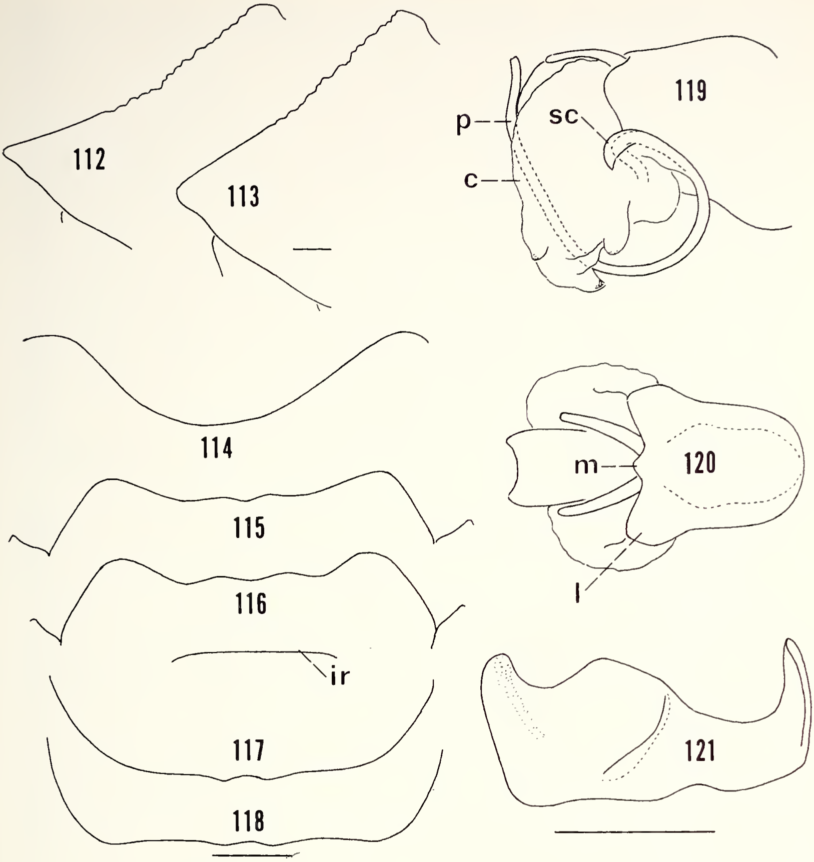
Euschistus emoorei Rolston, 1972, p. 183.

Medium size, length 10.0–11.6 mm. width at humeral angles 6.2–6.9 mm. General color of dorsum light brown, ventral surfaces paler yellowish-brown. Punctation on dorsum castaneous, moderately close, exceptionally uniform; usually a few small lacunae especially on hemelytra, but no calloused spots or clusters of punctures; punctation beneath concolorous with ventral surfaces.

Basal three segments of antennae concolorous with ground color of head, apical two segments slightly darker, a few small dark dots scattered on first segment; bucculae evanescent at base of head, as long as or slightly shorter than first rostral segment.

Anterolateral margins of pronotum nearly straight, apical two-thirds serrate; humeral angles little produced, angular or narrowly rounded, rarely spinose (Figs. 112, 113); disk anterior to humeri moderately declivent, nearly flat. Apex of scuttelum punctate, very margin often ivory, otherwise concolorous with disk; membrane of hemelytra hyaline, unspotted; veins simple or furcate, fumose. Connexiva narrowly exposed, darkly colored on either side of sutures.

Pleural surfaces with five black spots on each side. Evaporative area concolorous. Spiracles concolorous with surrounding surface.



Figs. 112–121. *E. emoorei.* Figs. 112–113. Variation in pronotal angles. Fig. 114. Posterior margin of pygophore, caudal aspect. Figs. 115–116. Variation in posterior margin of pygophore, ventral aspect. Figs. 117–118. Variation in posterior margin of pygophore, dorsal aspect; posterior margin of inferior ridge (ir). Fig. 119. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 120. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 121. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

Abdominal sternites spotted with black at anterolateral angle, usually minutely marked with black at posterolateral angle.

Posterior margin of pygophore evenly, concavely and rather deeply arcuate in caudal view (Fig. 114); broadly, shallowly, sinuously emarginated in ventral view, emargination sometimes nearly quadrate (Figs. 115, 116); broadly rounded to truncate in dorsal view, slightly sinuous mesially (Figs. 117, 118); posterior margin of inferior ridge nearly straight and transverse in middle, curving posteriorly at ends, forming anterior margin of transverse flattened-oval pit sunk into inner surface of pygophore. Superior ridge produced posteriorly and notched above proctiger. Preapical tubercles of proctiger joined by curved ridge. Three small appendages protrude from conjunctiva on each side, one blackly sclerotized at acute apex, other two sometimes faintly sclerotized at apex, obtuse (Fig. 119). Sclerotized cap present at base of penisfilum. Lateral lobes of theca developed, produced posteriorly beyond median lobe (Fig. 120). Parameres robust, lateral surface strongly cupped and with narrow subapical shagreened ridge (Fig. 121).

TYPE: Male, type no. 72031, U. S. National Museum.

DISTRIBUTION: From Colombia to Sonora and Chihuahua in northern Mexico.

COMMENT: This species resembles *E. crenator* and its allied species in size and general form. From these related species it may be distinguished by the male genitalia, and with few exceptions by the nearly straight anterolateral margins and exceptionally uniform punctation of the pronotum; whereas in the related species the anterolateral margin of the pronotum is seldom straight and the punctation along this margin is usually crowded.

Euchistus heros (Fabricius), 1798

Cimex heros Fabricius, 1798, p. 532.
Euschistus apicalis Dallas, 1851, p. 203.
Euschistus heros: Stål, 1868, p. 26.
Euschistus quadrimaculatus Distant, 1887, p. 62. **New Synonymy.**

Dorsum yellowish brown, deep maroon to black on humeri, ivory on apex of scutellum; punctation moderately dense, uniform excepting numerous lacunae on hemelytra, mostly castaneous, usually with numerous black punctures about cicatrices, on basal disk of pronotum, in four vague maculae at base of scutellum and macula in center of scutellar disk. Ventral surfaces brighter, more finely punctate than dorsum; three diffuse vittae on abdominal venter, one mesial, one on each side covering mesial end of pseudosutures, all occasionally obscure; sutures between spiracular lines much darker than adjacent sclerites. Length without membranes 9.7–12.8 mm.

Head a little longer than wide across eyes, 2.1–2.4 mm. long, 2.0–2.2 mm. wide; lateral margins subparallel for middle third of distance from eyes to apex; disk nearly flat; tylus surpassing juga. Antennae concolorous with disk of head, immaculate; basal segment nearly reaching apex of head; length of segments 0.6–0.8; 1.0–1.1; 1.3–1.8; 1.5–1.9; 1.6–1.8 mm. Bucculae subequal in length to basal segment of rostrum.

Pronotum 2.2–3.2 mm. long, 2.9–3.4 times as wide at humeri. Anterolateral margins closely denticulate from apex onto humeri; denticles concolorous with disk. Humeri strongly produced laterad, rising well above pronotal disk, usually spinose, occasionally only acutely angular (Figs. 122, 123).

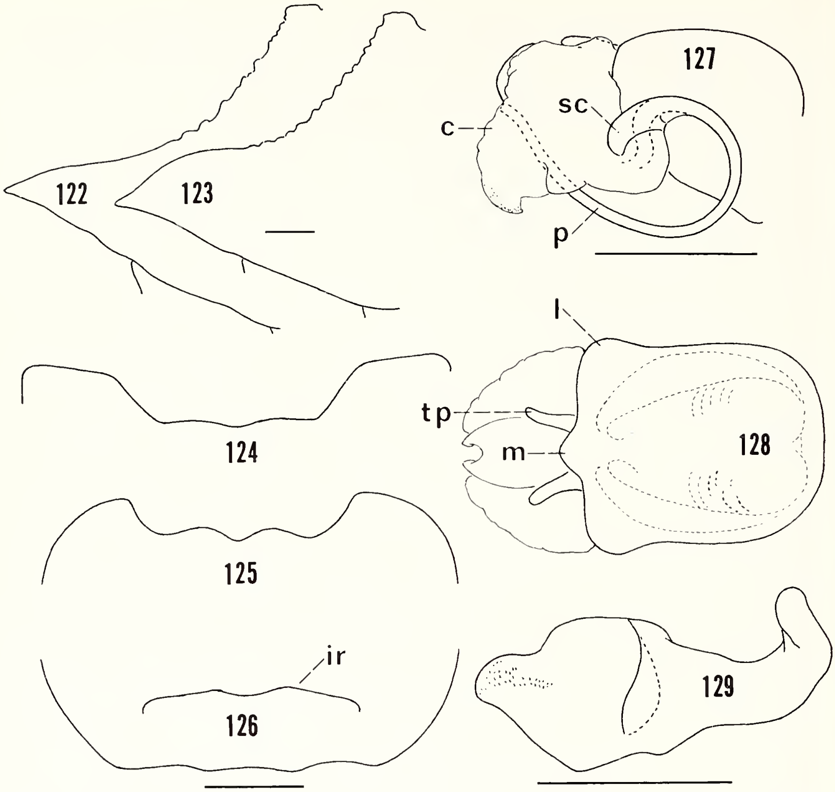
Scutellum a little longer than wide, 3.5–4.6 mm. long, 3.4–4.4 mm. wide, with moderately large deep black fovea at basal angles; apex ivory. Membrane of hemelytra clear to fumose; veins brown, simple or furcate. Connexiva castaneous, alternated with hazily defined yellowish brown spot along lateral border of each segment.

Pleural surfaces with four small black spots on each side, lacking spot at anterolateral angles of pronotum. Evaporative areas usually finely punctate with black, rarely entirely unicolorous. Legs concolorous with thoracic venter, immaculate or finely dotted with fuscous. Spiracles usually black or ringed with black.

Posterior margin of pygophore subquadrately emarginate in caudal view, sinuous at bottom of emargination (Fig. 124), concavely and sinuously emarginate in ventral view (Fig. 125), sinuously truncate in dorsal view (Fig. 126). Inferior ridge slightly overhanging excavation between ridge and posterior margin. Superior ridge sinuously produced above proctiger. Low black tubercle located on lateral carina anterolaterad of paramere on each side of genital cup. Tubercles of proctiger prominent, joined by ridge curving cephalad. Parameres robust, rather linear, with small, shagreened surface (Fig. 129). Two conjunctival appendages on each side, one acute and sclerotized at apex, other smaller, entirely hyaline (Fig. 127). Penisfilum with pronounced sclerotized cap at base. Thecal processes relatively short; median thecal lobe, but not lateral lobes, produced caudad (Fig. 128).

TYPE: Female, in Universitetes Zoologiske Museum, Copenhagen. Type examined.

SYNONYMY: The type specimen of *Euschistus quadrimaculatus* Distant, borrowed from the Institut Royal des Sciences Naturelles de Beligique, is lighter in color than most specimens of the species and the black punctures along the cicatrices are therefore more conspicuous than usual. In other respects this specimen is ordinary. The type of *E. apicalis* Dallas was examined.



FIGS. 122–129. *E. heros*. Figs. 122–123. Variation in humeral angle. Fig. 124. Posterior margin of pygophore, caudal aspect. Fig. 125. Posterior margin of pygophore, ventral aspect. Fig. 126. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 127. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 128. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m), thecal processes (tp). Fig. 129. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

DISTRIBUTION: Found in most of South America but apparently not abundant. May occur in Panama.

COMMENT: This species is most likely to be confused with *E. atrox*. In *E. heros* the apex of the scutellum is conspicuously pale bordered; in *E. atrox* the apex of the scutellum is either uniformly dark colored or very narrowly and inconspicuously pale bordered. Of the two species, *E. heros* is generally the more robust and the dorsum is usually darker, contrasting less strongly with the black humeri.

Euschistus integer Stål, 1872

Euschistus integer Stål, 1872, p. 28.—Distant, 1880, p. 60 Pl. 7 fig. 5.

Dorsum brownish yellow; rather densely, somewhat unevenly and lightly punctured with castaneous to black. Ventral surfaces sordid yellow; punctation concolorous or slightly darker, rather weak and dense. Length without membrane 10.2–11.0 mm.

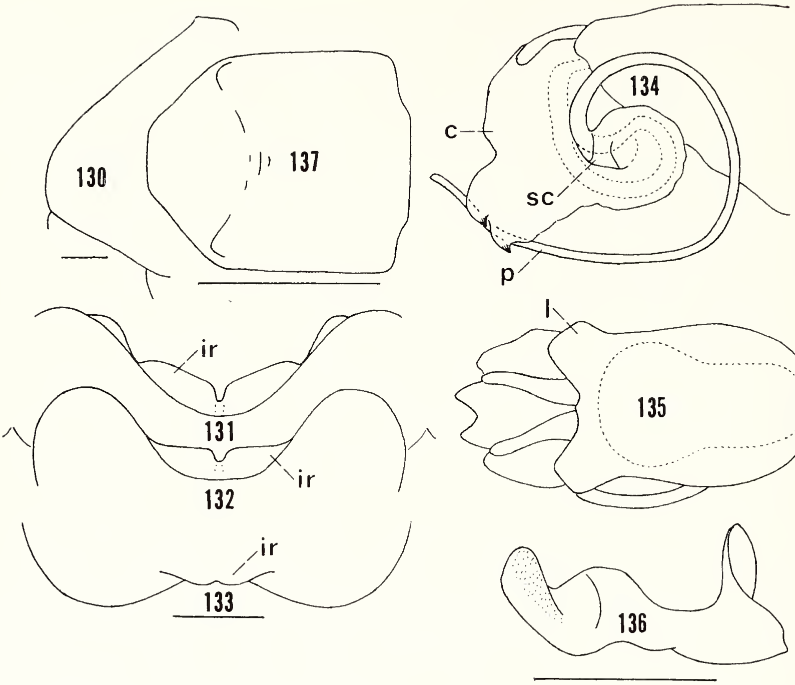
Head a little broader across eyes than long, 2.2–2.4 mm. wide, 2.1–2.2 mm. long. Lateral margins of juga tapering from eyes to rounded apex, subequal to tylus in length. Basal three antennal segments with fuscous dots, usually most conspicuous on basal segment; apical two segments immaculate, darker; length of segments 0.6; 0.9–1.1; 1.0–1.2; 1.4–1.5; 1.4–1.6 mm. Bucculae slightly exceeding basal segment of rostrum.

Pronotum 2.3–2.5 mm. long at meson, 2.4–2.6 times as wide at humeri. Disk rather flat before humeri, depressed posterolaterad of each cicatrice. Anterolateral margins straight or slightly convex, lightly reflexed, often with a few punctures darker and larger than others, entire or undulating apically (Fig. 130). Humeri scarcely produced, rounded.

Width and length of scutellum subequal, 3.6–4.0 mm. wide at base; fovea in basal angles small, composed of a few more or less confluent punctures; apex usually pale, concolorously punctate. Membrane of hemelytra faintly brown, occasionally much darker basally; veins simple or branched at base. Connexiva moderately exposed, alternated.

Thorax with five dark spots on each side; evaporative areas unicolorous. Legs conspicuously dotted with fuscous. Ventral surfaces occasionally flecked with pale red. Lateral margins of abdominal sternites with linear black mark at basal angles; apical angles immaculate or minutely black. Spiracles concolorous with supporting sclerites.

Posterior margin of pygophore deeply and broadly concave, exposing most of inferior ridge in caudal view (Fig. 131) and much of it in ventral view (Fig. 132). Lateral walls of genital cup bear several prominent black carina radiating from point on anterolateral margin of opening into genital cup. Inferior ridge notched mesially, membranous beneath notch, tuberculate laterally, projecting convexly from dorsal view (Fig. 133). Superior ridge above proctiger little



Figs. 130–137. *E. integer*. Fig. 130. Pronotum. Fig. 131. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 132. Posterior margin of pygophore, ventral aspect; inferior ridge (ir). Fig. 133. Posterior margin of pygophore, dorsal aspect; inferior ridge (ir). Fig. 134. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 135. Theca and related structures, dorsal aspect; lateral lobes (l). Fig. 136. Right paramere, lateral aspect. Fig. 137. Proctiger. Dimensional lines equal 0.5 mm.

produced, shallowly and broadly emarginate at apex. Proctiger armed with preapical tubercle on each side of shallow, broad impression (Fig. 137). Two small appendages on each side of conjunctiva, both sclerotized and acute at apex (Fig. 134). Penisfilum with sclerotized cap at base. Lateral lobes of theca strongly produced, obliquely truncate (Fig. 135). Parameres not strongly cupped, somewhat incrassate at apex (Fig. 136).

Type: Female, in Naturhistoriska Riksmuseum, Stockholm. Not seen.

Distribution: From Morelos to Sonora in Mexico.

Comment: The slightly reflexed anterolateral margins of the pronotum separate this species from those specimens of *E spurculus* in which this margin only undulates.

Euschistus lineatus Walker, 1867

Euschistus lineatus Walker, 1867, p. 245.—Distant, 1880, p. 60, Pl. 6 fig. 12 (type figured).

Dingy, brownish yellow, sometimes with faint suffusions of red on dorsum and brighter red flecks on ventral surfaces; impunctate fascia traversing pronotum behind cicatrices and another between humeri; similar, longitudinal fascia located intramarginally on each side of scutellum and along veins of corium. Punctation on dorsum fuscous, most densely arranged along margins of impunctate fasciae and pronotal denticles. Length 9.9 mm.

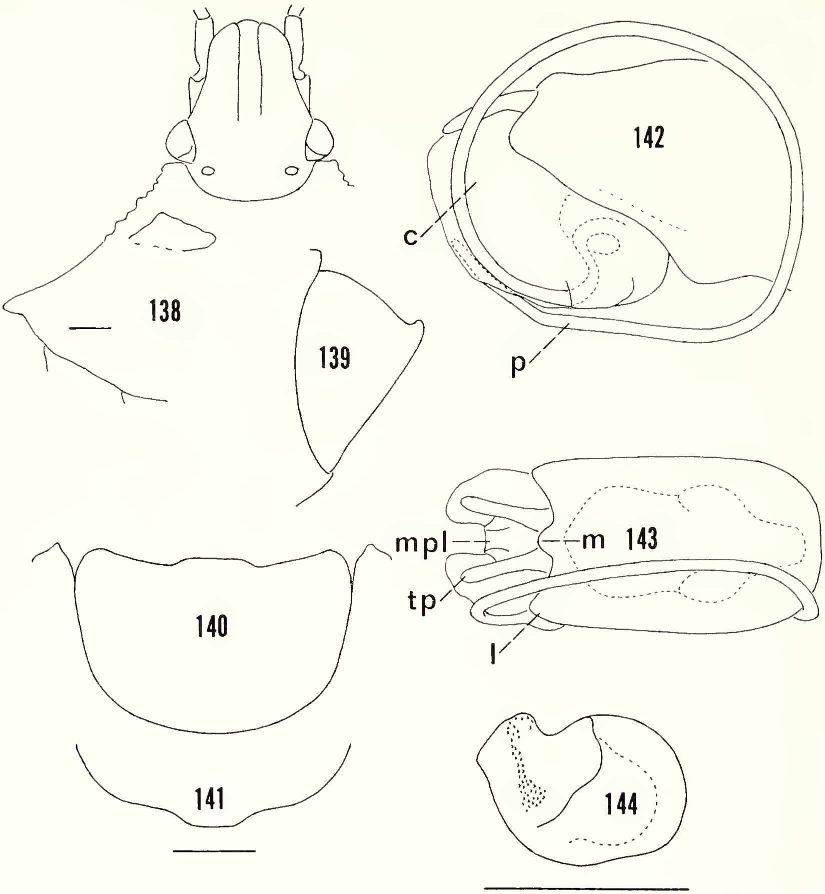
Lateral margins of head only slightly sinuate, converging very gradually to rather narrowly rounded apex (Fig. 138); juga and tylus subequal in length; width of head through eyes and length subequal, 2.1 mm. wide. Basal segment of antennae reaching apex of head; length of segments 0.6; 0.8; 1.3; 1.5; 1.5 mm.; color darkening from murky brownish yellow at base to fuscous at apex, with numerous, fine, dark dots on basal segment. Bucculae slightly longer than first rostral segment, evanescent at base of head.

Pronotum 2.5 mm. long at meson, 6.1 mm. wide at humeri. Apical half of anterolateral margins closely denticulate; denticles concolorous with disk, bordered mesially by narrow band of dense punctation. Humeral angles produced laterad into short spine.

Scutellum as broad at base as long, 3.6 mm. wide; basal angles without fovea; apex punctate, not contrastingly colored. Membrane of hemelytra frosted vitreous with contrasting, fuscous, simple or furcate veins and a few small spots of same color. Connexiva narrowly exposed, fuscous with pale, dense, rather fine punctation inside narrowly pale margin.

Pleural surfaces, including evaporative areas, and ventral surface of head with punctures of various sizes, some of them fuscous. Spots on femora and tibiae mostly quite small, fuscous, numerous. Punctures of abdomen concolorous with sclerites or reddish. Spiracles narrowly ringed with fuscous. Lateral angles of abdominal sclerites immaculate.

Broad, low, truncate, median protuberance on posterior margin of pygophore obvious in lateral, caudal and dorsal aspects (Figs. 139-141). Conjunctiva without apparent appendages (Fig. 142).



Figs. 138–144. *E. lineatus.* Fig. 138. Pronotum and head. Fig. 139. Posterior margin of pygophore, lateral aspect. Fig. 140. Pygophore, Ventral aspect. Fig. 141. Posterior margin of pygophore, dorsal aspect. Fig. 142. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 143. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m), thecal processes (tp). Fig. 144. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

Penisfilum lacking sclerotized cap at base, forming large loop. Lateral lobes of theca produced posteriorly a little beyond median lobe, not at all laterad (Fig. 143); thecal processes much longer than median penal lobes. Parameres somewhat spherical, deeply cupped, with narrow, irregular spiculate line on lateral surface of apex (Fig. 144).

TYPE: Female, in British Museum (Natural History), London. Type examined.

DISTRIBUTION: Vera Cruz, Mexico.

COMMENT: The conspicuous impunctate fasciae on the dorsum make this rare species easy to recognize.

12, 23 **Euschistus nicaraguensis** Rolston, 1972 f. 145-153

Euschistus nicaraguensis Rolston, 1972, p. 185.

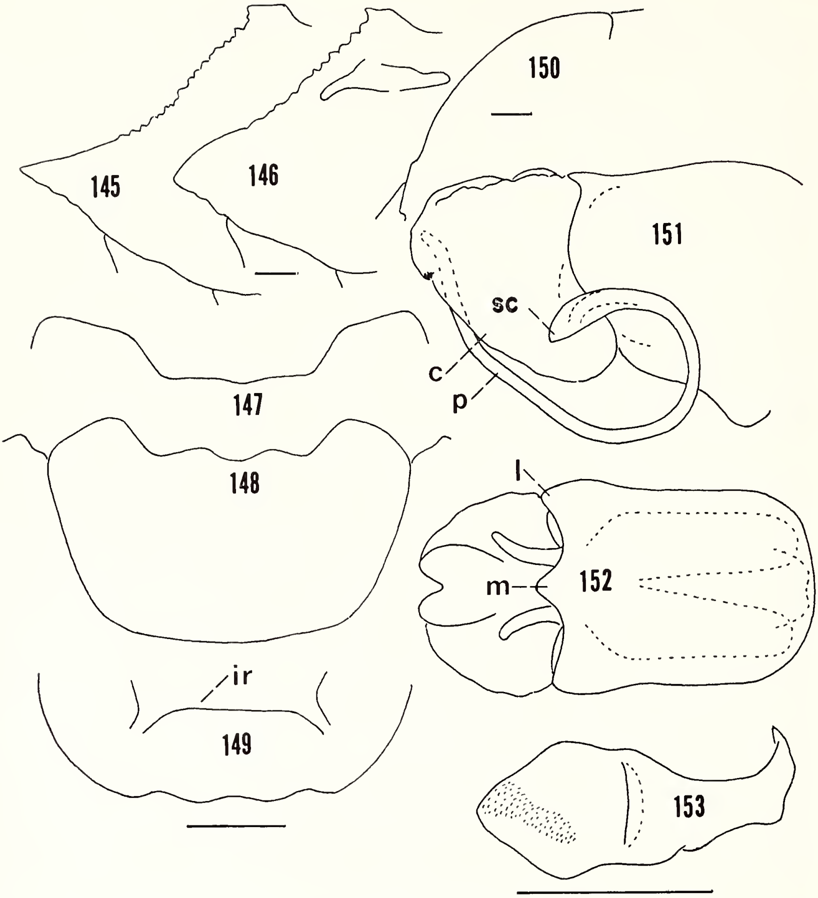
Robust, medium size, length 9.0–11.5 mm.; width at humeral angles 6.2–7.8 mm. General color blackish brown, ground color yellowish brown with moderately dense and rather uniformly distributed black punctures above and beneath, those on evaporative area finer and more sparse; small dark spots, sometimes obscure, scattered over basal three segments of antennae.

Lateral margins of head subparallel for about middle third of distance from eyes to apex. Bucculae evanescent at base of head, subequal to or slightly shorter than first rostral segment.

Anterolateral margins of pronotum unevenly concave, closely denticulate for about two-thirds distance from apex to humeral angles; humeri produced, angular to spinose, usually black, elevated, especially when spinose (Figs. 145, 146); lateral portion of cicatrices bent posteriorly, subparallel to anterolateral margin of pronotum; disk noticeably convex along meson (Fig. 150). Apex of scutellum punctate and concolorous with disk. Membrane of hemelytra frosty hyaline, unspotted; veins simple or furcate, differentiated more by form than darker color. Connexiva narrowly exposed; color darker than coria except for vaguely defined marginal area in middle of each segment.

Evaporative area sometimes reddish about black punctures. Abdominal sternites spotted with black at anterolateral angles of each segment and minutely marked with black at posterolateral angles; three vague, dark, longitudinal bands on abdomen, one mesial and one on each side closer to spiracles than to meson; margin of spiracles usually somewhat darker than surrounding surface.

Posterior margin of pygophore broadly emarginated to moderate depth in caudal view (Fig. 147); emargination broad, moderately deep, sinuous in ventral view (Fig. 148), sinuous in dorsal view (Fig. 149). Inferior ridge terminates posteriorly on each side in narrow buttress, posterior margin between these buttresses nearly straight; area between inferior ridge and posterior margin of pygophore evenly excavated except for pair of deeper almond shaped areas adjacent to inferior ridge. Superior ridge no more produced above proctiger



FIGS. 145–153. *E. nicaraguensis.* Figs. 145–146. Variation in humeral angle. Fig. 147. Posterior margin of pygophore, caudal aspect. Fig. 148. Pygophore, ventral aspect. Fig. 149. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 150. Lateral profile of pronotal disk at meson. Fig. 151. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 152. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 153. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

than on sides, not emarginated. Preapical lateral tubercles of proctiger broadly based, little elevated. Small appendage on each side of conjunctiva with apex lightly sclerotized, acute (Fig. 151). Penisfilum with sclerotized cap at base. Lobes of theca developed; median and lateral lobes about equidistantly produced posteriorly (Fig. 152). Parameres robust, rather linear; lateral surface strongly cupped; cephalic margin bearing quite long, preapical setiferous tuft, conspiculously surpassing apex of parameres (Fig. 153).

Type: Male, Type No. 72032, U. S. National Museum.

Distribution: Panama to Honduras.

Comment: This species resembles *E. atrox,* but Westwood's species is readily separated by the flatly sloping longitudinal profile of the pronotal disk anterior to the humeri and especially by the posterior margin of the pygophore, which is trisinuate from the dorsal, caudal, and ventral views.

While this species is most common on various weeds, it also feeds on cotton and rice.

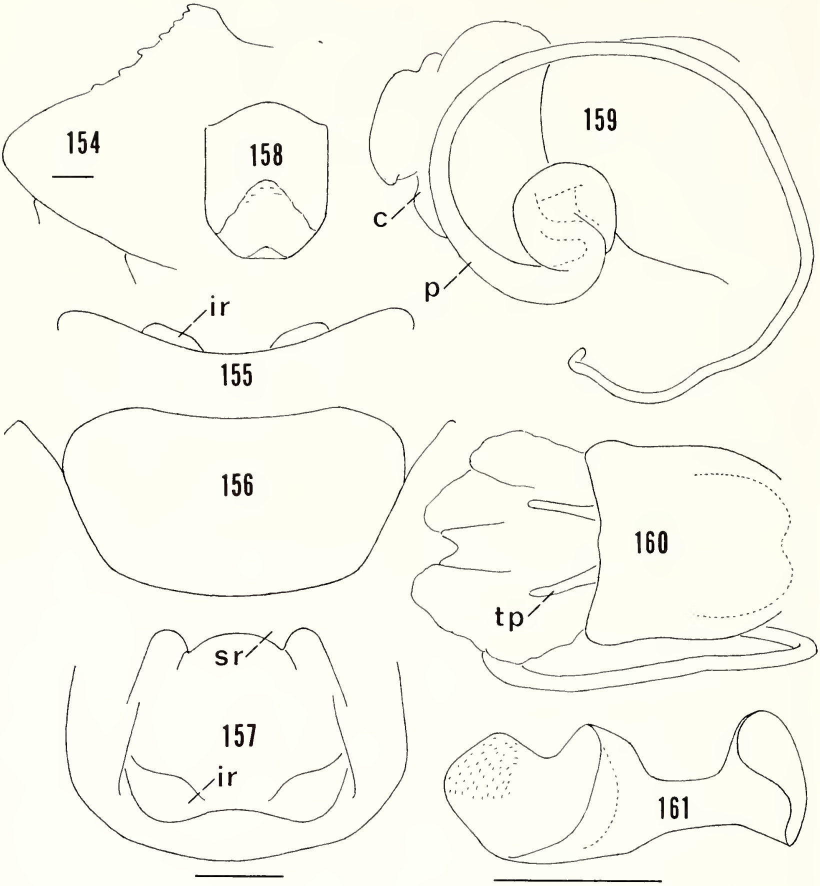
Euschistus obscurus (Palisot de Beauvois), 1805

Pentatoma obscura Palisot de Beauvois, 1805, p. 149, Pl. 10 fig. 9 (♀).
Euschistus bifibulus, auct. (*nec* Pal. Beauv.): Van Duzee, 1904, p. 48 (list).—Barber, 1906, p. 259 (list).—Barber, 1914, p. 522 (list).—Blatchley, 1926, p. 140 (description).
Euschistus ursus Van Duzee, 1907, p. 8.
Euschistus atromaculosus Barber, 1927, p. 241.
Euschistus obscurus: Barber & Bruner, 1932, p. 255.—Torre-Bueno, 1939, p. 223 (key).—Chapin, 1959, (biology, immatures).

Posterior margin of pygophore broadly concave to moderate depth in caudal view, with part of inferior ridge exposed (Fig. 155), somewhat more than middle half very shallowly concave in ventral view (Fig. 156), broadly rounded in dorsal view (Fig. 157); inferior ridge quite tumid on each side, its posterior boundary sinuous. Superior ridge little produced, concave above proctiger. Abrupt depression beginning near middle of proctiger, expanding posteriorly to cover entire apex, containing second, small, mesial depression at apex; tubercles obscure (Fig. 158). Appendage on each side of conjuctiva faintly sclerotized at apex (Fig. 159). Penisfilum without apparent sclerotized cap. Lobes of theca poorly developed (Fig. 160); thecal processes well separated at base. Parameres strongly cupped, obtusely rounded at apex (Fig. 161).

Type: Female. Apparently lost.

Distribution: Cuba, Jamaica, along the Gulf of Mexico from Florida to Tamaulipas, Mexico.



Figs. 154–161. *E. obscurus*. Fig. 154. Pronotum. Fig. 155. Posterior margin of pygophore, caudal aspect. Fig. 156. Pygophore, ventral aspect. Fig. 157. Genital cup, dorsal aspect, omitting parameres and proctiger. Fig. 158. Proctiger. Fig. 159. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 160. Theca and related structures, dorsal aspect; thecal processes (tp). Fig. 161. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

COMMENT: The preceding description of the male genitalia is an addition to the accurate description of this species under the name *E. atromaculosus* Barber. It is one of the most distinctive species of the genus because of the numerous, small dark spots on the hemelytra, the dense, black punctation of the head and most of the anterior pronotal disk, and the sparsely punctate fascia that joins the moderately produced and rounded humeri (Fig. 154).

// **Euschistus ruckesi**, new species f. 162-[illegible]

Dense black punctation of dorsum arranged more or less in rows on base of pronotum and on scutellum, with rugose, sordid yellow interstices; numerous small pale calloused spots scattered over dorsum except on head. As dark beneath as above, thickly punctured with castaneous to black. Length 9.9–10.2 mm.

Head 2.2–2.3 mm. wide across eyes, 1.9–2.1 mm. long; lateral margins tapering from eyes to broadly rounded apex (Fig. 162); vertex, base of tylus and adjoining disk somewhat elevated, head otherwise nearly flat. Antennal segments ringed with fuscous apically, narrowly on two basal segments, about half of third, two thirds of apical two segments; two basal segments additionally dotted or streaked; basal segment nearly reaching apex of head; length of segments 0.6–0.7; 0.8; 0.8–0.9; 0.9–1.2; 1.3 mm. Bucculae obtusely toothed anteriorly, evanescent at base of head, subequal in length to basal segment of rostrum.

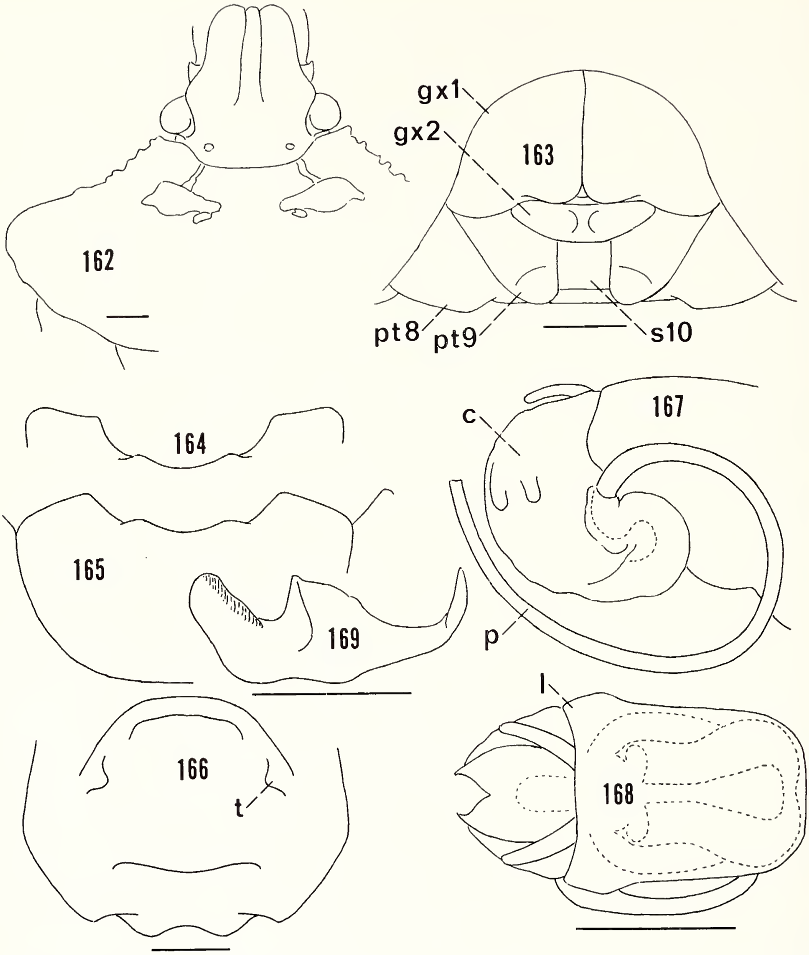
Pronotum 2.2–2.4 mm. long at meson, 5.9–6.4 mm. wide across humeri. Pale calloused spot near posteromesad border of each cicatrice and pair of pale streaks converging toward head, each arising from middle of anterior border of cicatrice. Anterolateral margin with pale denticles. Humeri moderately produced, rounded. Declivent part of disk impressed, especially posterolaterad of cicatrices.

Scutellum longer than wide, 3.2–3.7 mm. across base, 3.6–3.9 mm. long; disk rather rough; fovea at basal angles obscure. Costal margin of hemelytra reflexed at very base; membrane small, brownish, with a few sparsely branched veins. Connexiva rather broadly exposed, fuscous, obscurely alternated. Abdomen at level of scutellar apex as broad as pronotum across humeri, unusually convex.

Evaporative areas with fine, dark punctures. Black spots on legs large on femora, smaller and somewhat faded on broadly sulcate tibiae. Spiracles ringed with black. Lateral angles of abdominal sternites immaculate.

Right first gonocoxa slightly overlapping left at base (Fig. 163). Second gonocoxa depressed mesially. Ninth paratergite longitudinally concave near base, elevated and obtuse at apex. Tenth sternite nearly square.

Mesial half of posterior margin of pygophore concavely emarginate in both caudal and ventral aspects, sinuous at bottom of concavity



FIGS. 162–169. *E. ruckesi.* Fig. 162. Head and pronotum. Fig. 163. Female genital plates; first gonocoxa (gx1), second gonocoxa (gx2), eighth paratergite (pt8), ninth paratergite (pt9), tenth sternite (s10). Fig. 164. Posterior margin of pygophore, caudal aspect. Fig. 165. Pygophore, ventral aspect. Fig. 166. Genital cup, dorsal aspect, with proctiger and parameres removed; superior ridge (sr), tubercle (t). Fig. 167. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 168. Theca and related structures, dorsal aspect; lateral lobes (l). Fig. 169. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

(Figs. 164, 165); posterior margin trisinuate in dorsal aspect (Fig. 166); surface of genital cup behind inferior ridge transversely sulcate; rather large tubercle located on each lateral wall of genital cup near apex of paramere. Superior ridge entire. Preapical tubercles of proctiger obscure. Two appendages on each side of conjunctiva small, digitiform (Fig. 167). Penisfilum with annular sclerotized cap at base. Thecal lobes poorly developed (Fig. 168). Parameres slightly indented near middle of striated area from lateral aspect, shallowly cupped (Fig. 169).

HOLOTYPE: Female, labeled (a) 8 mi. S. Teziutlan, Puebla, Mexico. 6575 ft. July 30, 1955 (b) P. & C. Vaurie, Collectors. Deposited in the American Museum of Natural History.

PARATYPE: Male, Mexico, Vera Cruz nr. Huatusco, July 25-26, 1965 (LHR).

DISTRIBUTION: Mexican states of Puebla and Vera Cruz.

COMMENT: This species is dedicated to the late Prof. Herbert Ruckes who contributed much to the systematics of the pentatomids.

The abdomen of this species is unusually robust for the genus. The pale streaks arising near the middle of the anterior border of the cicatrices and converging toward the head, although obscure, will be a convenient means of recognizing *E. ruckesi* if they prove to be a consistent feature of the species.

Euschistus rufimanus Stål, 1872

Euschistus rufimanus Stål, 1872, p. 27.

Dorsum yellowish brown, tinged with red on all or part of head, deepening to dark brown or fuscous at humeral angles; punctation moderately dense and uniform, castaneous to fuscous. Yellowish brown beneath; punctation of abdomen finer with dark punctures restricted to band across basal segment, vitta on each side mesad of spiracular line, mesial broken vitta on last two or three segments, and scattered punctures on disk. Antennae, apex of tibiae and tarsi largely rufous. Length 7.9 to 8.6 mm. without membranes.

Head as long as wide, 1.7–2.0 mm. across eyes. Tylus surpassing juga. Lateral margins of juga subparallel for middle third of distance from eyes to apex of juga, almost completely exposing antenniferous tubercles from above. Lateral outline of eyes elliptical from above, appearing to protrude to unusual degree (Fig. 170). Basal segment of antennae yellowish brown, minutely dotted with fuscous; following two segments and basal portion of fourth rufous, obscurely and minutely dotted with deeper red or brown; remainder of antennae brown; length of segments 0.5–0.6; 0.6–0.8; 0.8–0.9; 0.7–0.9; 0.8–1.0 mm. Bucculae roundly truncate to evanescent at base of head, slightly surpassing apex of basal segment of rostrum (Fig. 171).

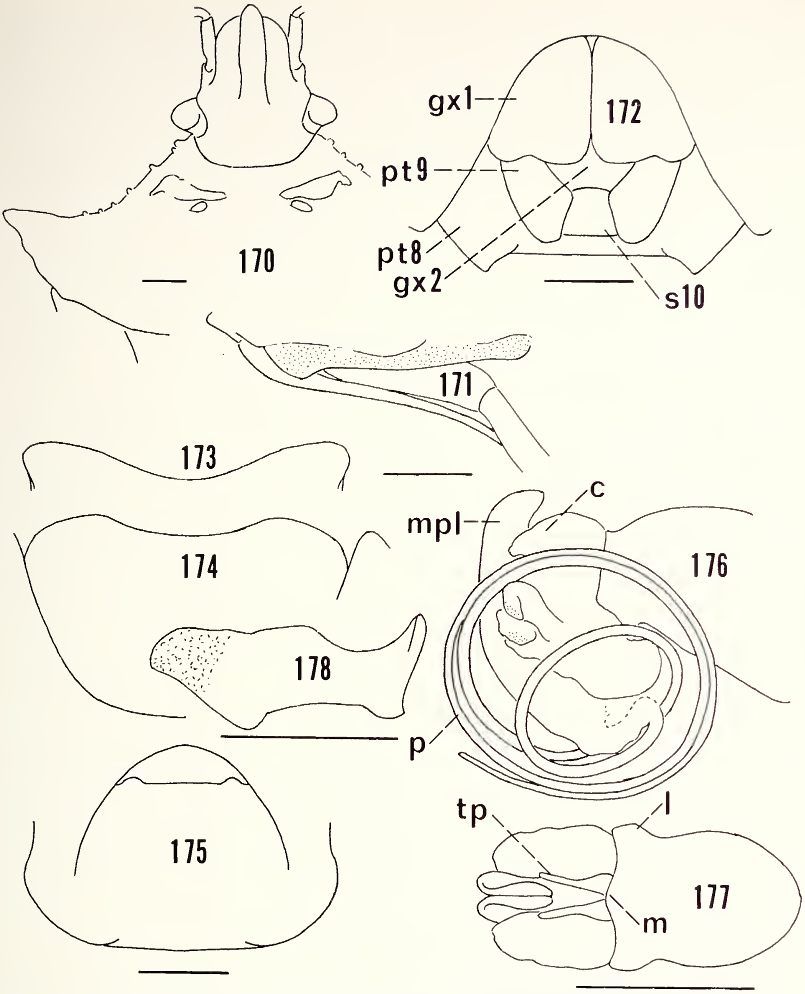
Pronotum 1.9–2.1 mm. long at meson, 2.7–3.4 times as wide at humeri. Anterolateral margins subcarinate, denticulate from apex onto humeri; denticles whitish, peg shaped, most widely separated; apex either truncate behind eyes or tapering to head. Humeri moderately elevated, angles acute, turned forward, connected by sparsely punctate subcalloused or calloused fascia. Disk convex before fascia; submarginal impression along anterior border produces collar effect around base of head; slightly calloused spot near posteromesial border of each cicatrice a little paler than disk.

Width and length of scutellum subequal, 2.8–3.4 mm. wide at base; fovea in basal angles small, deep, black; apex rather broadly rounded, narrowly bordered with ivory. Punctation of hemelytra a little denser, finer than on scutellum; membrane frosty; veins light brown, simple or furcate. Connexiva moderately exposed; black along margin confined to macule at sutures or diffused as more or less continuous band of irregular width; density and size of punctures little greater than along costal margin of hemelytra; margin serrate, apical angles of each segment obtuse, protruding laterad of margin at base of following segment.

Evaporative areas extending about two-fifths distance from ostiole to lateral margin of supporting sclerite; more finely and sparsely punctate with castaneous or fuscous than adjacent areas. Legs yellowish brown, apex of tibiae and all of tarsi rufous, with brown or fuscous dots of small to moderate size, these numerous on femora. Peritreme of spiracles darker than surrounding area. Margin of abdominal sclerites dotted with fuscous at basal angles, indistinctly marked at apical angles.

First gonocoxae of genital plates longer than wide, concavely emarginate above ninth paratergites; posterior margin of second gonocoxae concave between ninth paratergites, apex of latter not reaching apex of abdomen (Fig. 172). Tenth sternite wider at apex than at base. Apex of eighth paratergites sub-acutely produced.

Posterior margin of pygophore shallowly, concavely emarginated in both caudal and ventral aspects (Figs. 173, 174), truncate in dorsal aspect (Fig. 175). No clearly defined inferior ridge. Preapical tubercles of proctiger prominent. Median penal lobes strongly developed, rising above dorsal plane of theca (Fig. 176). Penisfilum coiled, forming nearly four loops, without obvious sclerotized cap at base. Conjunctiva with three small appendages on each side; dorsal



FIGS. 170–178. *E. rufimanus*. Fig. 170. Head and pronotum. Fig. 171. Buccula, lateral aspect. Fig. 172. Female genital plates; first gonocoxa (gx1), second gonocoxa (gx2), eighth paratergite (pt8), ninth paratergite (pt9), tenth sternite (s10). Fig. 173. Posterior margin of pygophore, caudal aspect. Fig. 174. Pygophore, ventral aspect. Fig. 175. Genital cup, dorsal aspect, with proctiger and parameres removed. Fig. 176. Theca and related structures, lateral aspect; conjunctiva (c), median penal lobes (mpl), penisfilum (p). Fig. 177. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m), thecal processes (tp). Fig. 178. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

appendage entirely membraneous, lateral appendages each bearing sclerotized plate near apex. Thecal processes incrassate at base (Fig. 177); thecal lobes moderately developed. Parameres rather linear, obscurely reticulated on lateral surface of apex (Fig. 178); tubercle on posterior margin bearing numerous setae of moderate length.

Type: Female, in Naturhistoriska Riksmuseum, Stockholm. Type examined.

Distribution: Colombia, Curaçao.

Comment: The unusual denticulation of the anterolateral pronotal margins, elliptical shape of the eyes, protruding tylus, and often the rufous color on the appendages characterize this rather small species. It has been taken on soybeans in Colombia.

Euschistus rugifer Stål, 1872

Euschistus rugifer Stål, 1872, p. 26.—Distant, 1880 p. 59, Pl. 6 figs. 8, 9.

Dorsum sordid white to yellowish brown, punctation moderately dense, uniformly arranged; punctures mostly castaneous, black in small scattered patches occuring especially about cicatrices, base of scutellum and often on hemelytra. Yellow to orange yellow beneath, often flecked with red; concolorously punctate except dark punctures on prothorax adjacent to posterolateral border of sparsely punctate elevated area at lateral end of supracoxal cleft. Length without membranes 10.0–12.9 mm.

Head subequal in width and length, 2.1–2.5 mm. wide across eyes. Juga shallowly impressed submarginally, lateral margins tapering slightly from concavity before eyes to moderately rounded apex of head. Antennae brownish yellow, immaculate excepting faded dots on basal segment. Basal segment reaching apex of head; length of segments 0.5–0.7; 0.9–1.2; 1.1–1.7; 1.3–1.9; 1.1–1.8 mm. Bucculae evanescent at base of head, equalled or slightly exceeded by basal segment of rostrum.

Pronotum 2.5–3.2 mm. long at meson, 2.5–3.1 times as wide across humeri. Anterolateral margin concave, denticulate from apex onto humeral angles; denticles pale, subacute, inclined toward humeral angle, irregularly spaced, several denticles often closely placed and well separated from next denticle (Fig. 179). Humeral angles acutely angulate, joined by sparsely punctate, usually calloused fascia.

Scutellar width and length subequal, 3.7–4.9 mm. wide at base; a few black punctures often clustered at basal angles but no clear fovea. Membrane of hemelytra brownish at inner angle, narrowly, irregularly so along veins, otherwise vitreous; veins usually sparingly reticulate, brown. Moderately exposed connexiva strongly alternated, fuscous at base and apex of each segment, brownish yellow in middle; punctation close, rather coarse, mostly pale, obscure on light colored portion of segments.

Pleural regions of thorax with five small dark spots on each side, often only those at base of subcoxae distinct. Evaporative area often red flecked, never punctate with black. Dots on femora small, faded; tibiae essentially immaculate. Narrow, elongate, fuscous streak at basal angles of abdominal sternites; apical angles parsimoniously marked with fuscous. Peritreme of spiracles usually slightly darker than surrounding area, rarely concolorous.

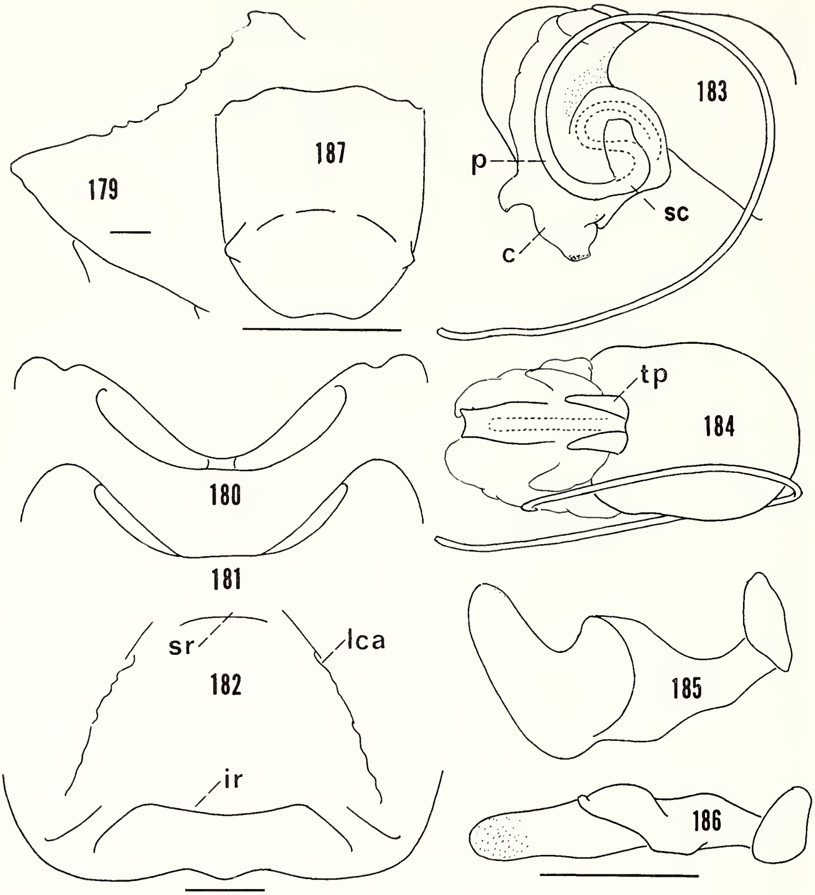
Inferior ridge largely exposed above posterior margin of pygophore in caudal view, broadly and rather deeply concave, appearing membraneous mesially (Fig. 180); both inferior ridge and posterior margin of pygophore broadly concave in ventral view, former partially obscured by truncate mesial portion in concavity of latter (Fig. 181). Posterior margin of pygophore sinuous from dorsal view, with narrow convexity at meson, separated from posterior margin of inferior ridge by narrow sulcus, this limited laterally by diagonal buttresses of inferior ridge (Fig. 182); black, serrate rims of genital cup continued into cup at cephalic end as carina. Three appendages located on each side of conjunctiva, dorsal appendage digitiform and entirely hyaline, one of smaller appendages terminating in small sclerotized plate, other appendage hyaline or lightly pigmented at apex (Fig. 183). Penisfilum with large, sclerotized cap at base. Lobes of theca poorly developed; thecal processes rather short (Fig. 184). Parameres simple, margin of open cup diagonal from cephalic view (Figs. 185, 186). Proctiger strongly impressed between preapical tubercles (Fig. 187).

Types: The syntypes, in the Naturhistoriska Riksmuseum, Stockholm, were examined. The following specimen is designated as the lectotype: Male, labeled (a) Mexico (b) Sallé (c) Type (d) Typus (e) 5922 (f) Riksmuseum Stockholm.

The remaining specimens of the syntypes are designated as paralectotypes.

1. Male, labeled (a) Mexico (b) Sallé (c) ♂ (d) Type (e) Paratypus (f) 5722 (g) Riksmuseum Stockholm.
2. Male, labeled (a) Mexico (b) Boucard (c) Type (d) Paratypus (e) 5822 (f) Riksumuseum Stockholm.
3. Female, labeled as above except (d) Allotypus (e) 6022.
4. Female, labeled as above except (b) Sallé (e) 6122.

Distribution: From Chiapas to Sonora in Mexico.



FIGS. 179–187. *E. rugifer.* Fig. 179. Pronotum. Fig. 180. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 181. Posterior margin of pygophore, ventral aspect. Fig. 182. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), lateral carina (lca), superior ridge (sr). Fig. 183. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 184. Theca and related structures, dorsal aspect; thecal processes (tp). Fig. 185. Right paramere, lateral aspect. Fig. 186. Right paramere, cephalic aspect. Fig. 187. Proctiger. Dimensional lines equal 0.5 mm.

COMMENT: *E. rugifer* resembles *E. bifibulus* but the two species differ in many features. The brownish inner angle of the otherwise nearly vitreous membrane and, commonly, the sparsely reticulated venation of *E. rugifer* contrast with the entirely fumose membrane and simple venation of *E. bifibulus*. *E. rugifer* is generally more robust than *E. bifibulus* and usually differs further in having the peritremes of the spiracles dusky, the basal disk of the scutellum roughly tumose, and the fascia between the humeri colloused. The male genitalia afford infallible means of distinguishing between the two species.

10 **Euschistus schaffneri**, new species – 47

Dorsum light yellowish brown; somewhat thinly punctate except at base of scutellum; punctures mostly light castaneous, black punctures scattered on head, along anterior and anterolateral pronotal margins, and costal margin of hemelytra, especially near base. Ventral surfaces whitish yellow, concolorously punctate. Length without membranes 8.5–9.4 mm.

Head a little wider across eyes than long, 2.1 mm. wide, 1.9–2.0 mm. long; lateral margins subparallel for middle third of distance from eyes to broadly rounded apex. Juga little or no longer than tylus. Basal three segments of antennae sordid yellow, irregularly dotted with fuscous; third segment darker toward apex, two apical segments fuscous excepting basal quarter to third of each; length of segments 0.5–0.6; 0.8; 0.8–1.1; 0.9–1.0; 1.2 mm.

Pronotum 2.0–2.3 mm. long, 2.5–2.6 times as wide at humeri. Anterolateral margins nearly straight, broadly reflexed, undulating to obtusely denticulate on apical half or less (Figs. 188, 189). Humeri little produced, broadly rounded. Disk deeply impressed submarginally posterolaterad of somewhat obscure cicatrices.

Scutellum about as broad at base as long, 3.1–3.5 mm. long; fovea in basal angles obscure; apex punctate. Costal margin of hemelytra narrowly but distinctly reflexed along basal third; membrane small, subcircular, fumose; veins incompletely reticulate. Connexiva rather broadly exposed; black along lateral margins fading mesad to castaneous, narrowly alternated with sordid yellow in middle of each segment; punctation pale, coarse, close, obscure in sordid yellow bands.

Pleural region of thorax with five black spots on each side; spot at anterolateral angle of pronotum composed of numerous more or less discrete black punctures. Legs rather sparsely ornated with small black dots. Large black arcuate dot at basal angles of abdominal sternites. Spiracles concolorous with supporting sclerites.

Posterior margin of pygophore emarginate on both sides of mesial lobe, trisinuate in caudal, ventral and dorsal views (Figs. 190-192). Superior ridge notched mesially. Inferior ridge lacking. Conjunctiva with median appendage dorsad of median penal lobes and large appendage on each side, all hyaline (Figs. 193, 194). Penisfilum emerging mesially. Lateral lobes of theca surpassing median lobe, not expanded laterad. Parameres nearly uniform in breadth distad of cup, with barely roughened area on lateral surface (Fig. 195). Well developed tubercles on proctiger placed nearly midway between base and apex, nearer apex (Fig. 196).

HOLOTYPE: Male, labeled 20 mi. E. of Concordia, Sinaloa, Mexico. Sept. 2, 1957. J. C. Schaffner. Type no. 72127, U. S. National Museum.

PARATYPES: 2 ♂♂, 1 ♀. Same data as holotype (♂ LHR); (a) Mexico, Jalisco, 3 mi. S. "Mazamilta" (or "Mazamitla"), V-10-1963 (b) W. J. Gertsch, W. Ivie (♂ AMNH, ♀ TAMU).

DISTRIBUTION: Mexican states of Sinaloa and Jalisco.

COMMENT: I take great pleasure in naming this species for Prof. J. C. Schaffner as a token of gratitude for his consistent support.

The deep submarginal impressions and broadly reflexed anterolateral margins of the pronotum, and the lightly reflexed basal third of the costal margins and small, subcircular membrane of the hemelytra distinguish this species.

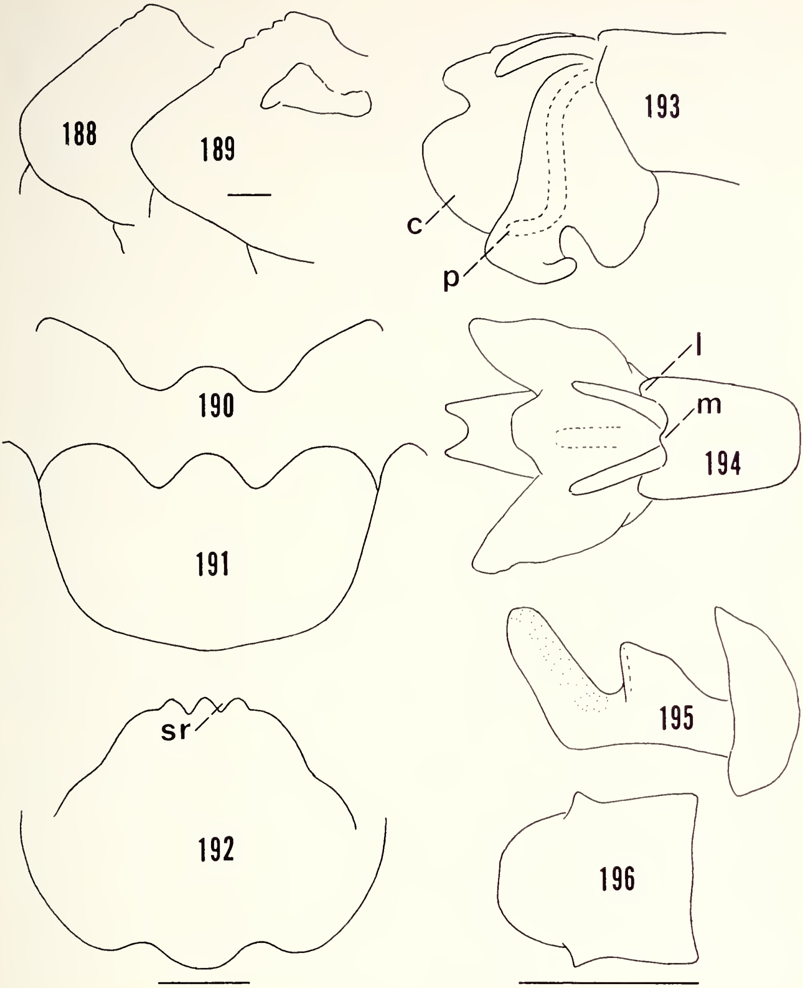
Euschistus servus servus (Say), 1832

F. 197-206

Pentatoma serva Say, 1832, p. 4.—Say, 1859, p. 314.
Pentatoma spilota [Westwood] 1837, p. 42.
Euschistus servus: Stål, 1872, p. 26.—Van Duzee, 1904, pp. 44, 45.—Foote and Strobell, 1914, p. 337.—Blatchley, 1926, p. 130 (description).—Torre-Bueno, 1939, p. 221 (key).—Sailer, 1954, p. 377 (hybridization).—Rolston, 1961, p. 151 (biology).
Euschistus impictiventris Stål, 1872, p. 26.—Van Duzee, 1904, pp. 44, 45.—Torre-Bueno, 1939, p. 221 (key). **New Synonymy**.

Dorsum light yellowish tan to dark brown, occasionally tinged with red, somewhat sparsely and unevenly punctate with castaneous to black, without callouses or more than an occasional dark spot. Sordid white to brownish yellow beneath, sometimes tinged with green or flecked with red; concolorously punctate. Length without membranes 10.8–14.1 mm.

Length and width of head subequal, 2.4–2.9 mm. wide across



FIGS. 188–196. *E. schaffneri.* Figs. 188–189. Variation in denticulation and humeral angles of pronotum. Fig. 190. Posterior margin of pygophore, caudal aspect. Fig. 191. Pygophore, ventral aspect. Fig. 192. Outline of genital cup; superior ridge (sr). Fig. 193. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p). Fig. 194. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 195. Right paramere, lateral aspect. Fig. 196. Proctiger. Dimensional lines equal 0.5 mm.

eyes. Juga usually slightly longer than tylus, lateral margins subparallel for middle third of distance from eyes to apex. Antennae brownish yellow, apical two segments often a little darker, often a few dots on basal segments, otherwise immaculate; basal segment not quite reaching apex of head; length of segments 0.7–0.8; 1.1–1.2; 1.2–1.5; 1.3–1.6; 1.6–1.8 mm. Bucculae evanescent at base of head, subequal in length to basal segment of rostrum.

Pronotum 2.7–3.5 mm. long at meson, 2.6–2.8 times as wide at humeri. Concave anterolateral margins closely denticulate about half way from apex to humeral angles; denticles concolorous with or paler than disk. Humeral angles rounded to acutely angular (Figs. 197-199).

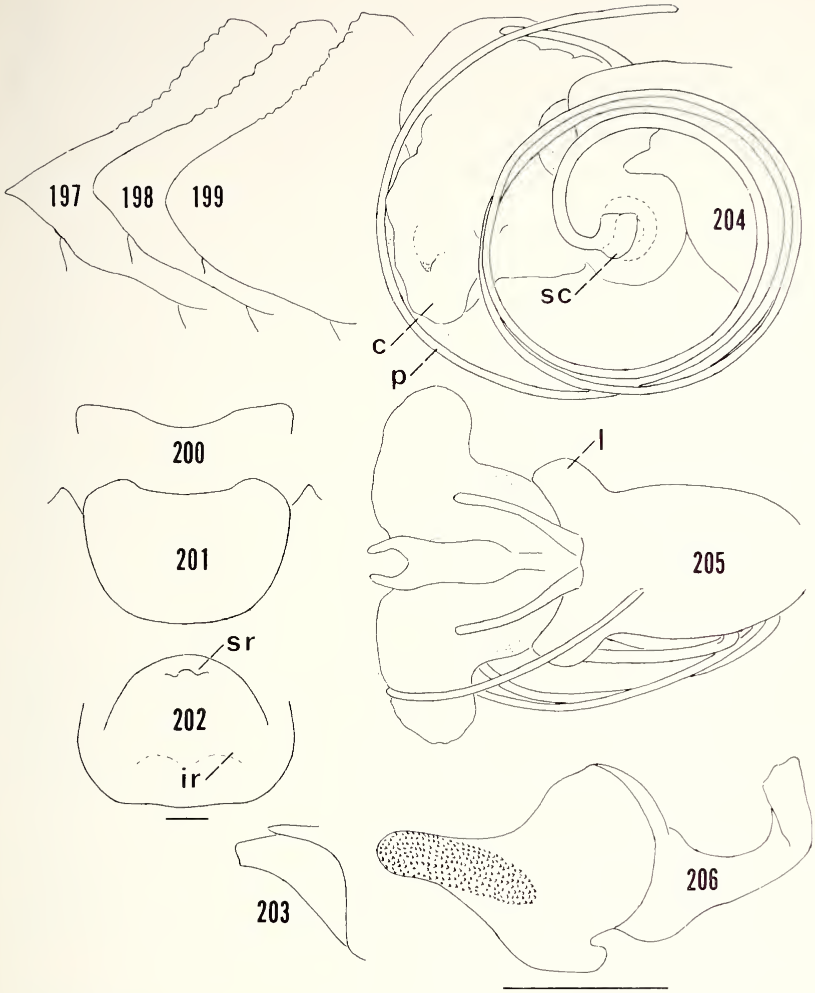
Scutellar breadth and length subequal, 4.0–5.4 mm. wide at base, with a few black punctures clustered in basal angles forming weak fovea; margin of apex usually indistinctly pale. Membrane clear to slightly fumose, with numerous small dark spots, these sometimes obscure; veins simple or furcate. Connexiva narrowly to broadly exposed, alternated with castaneous to fuscous band along intersegmental sutures.

Pattern of five black dots on each side of thorax frequently incomplete, sometimes lacking; evaporative area uniformly colored. Legs with small blackish dots on femora and tibiae, or immaculate. Spiracles concolorous with sternites. Small black dot at basal angles of abdominal sternites rarely absent; apical angles often minutely blackened at very apex.

Pygophore labiate in lateral view (Fig. 203); posterior margin shallowly concave along middle half in caudal view (Fig. 200), more broadly, somewhat rectangularly emarginate in ventral view (Fig. 201), truncate, slightly sinuous in dorsal view (Fig. 202). Inferior ridge not clearly defined. Superior ridge roundly notched at meson. Small appendage on each side of conjunctiva sclerotized at apex (Fig. 204). Penisfilum coiled in three loops. Lateral lobes of theca large, median lobe obscure (Fig. 205). Apex of parameres digitiform, posterior margin with blunt hook directed basad (Fig. 206). Tubercles on proctiger preapical.

TYPE: Apparently lost.

SYNONYMY: The form described by Stal as *E. impictiventris* is characterized mainly by a paler brown dorsum and acute humeral angles, a combination of characters prevailing in the southwestern United States. The coloration of the dorsum is a cline following Gloger's Rule of variation, i.e. individuals from arid regions are generally paler in color than those from humid regions. Individuals with



FIGS. 197–206. *Euschistus servus servus*. Figs. 197–199. Variation in humeral angles. Fig. 200. Posterior margin of pygophore, caudal aspect. Fig. 201. Pygophore, ventral aspect. Fig. 202. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), superior ridge (sr). Fig. 203. Profile of pygophore, right lateral aspect. Fig. 204. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 205. Theca and related structures, dorsal aspect; lateral lobes (l). Fig. 206. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

acute humeral angles are not confined to the southwest and occur commonly throughout the southern range of the species. The genitalia are alike in specimens diverging in color and in the form of the humeri. The type of *E. impictiventris* was not examined.

DISTRIBUTION: Middle American distribution is confined to the Mexican – USA border region.

Euschistus spurculus Stål, 1862

Euschistus spurculus Stål, 1862, p. 100—Stål, 1872, p. 28.—Distant, 1880, p. 59, Pl. 6 fig. 10.

Dark brown dorsum with black punctation thickest on head and scutellum, moderately dense elsewhere. Sordid white to pale yellow beneath, concolorously punctate. Body depressed, length 7.7–9.5 mm. without membranes.

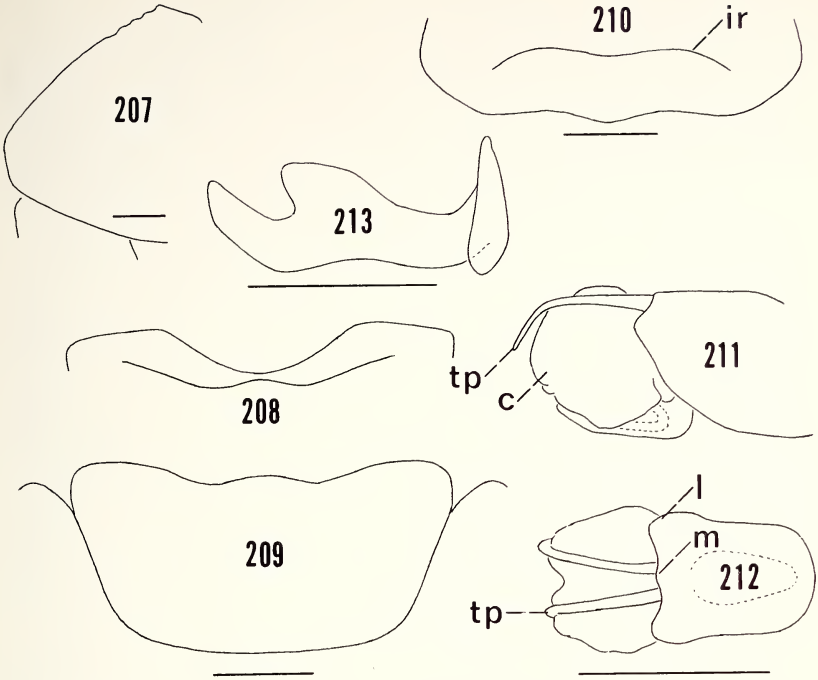
Head a little broader across eyes than long, 1.8–2.1 mm. wide, 1.6–1.9 mm. long. Juga slightly depressed submarginally; lateral margins tapering from eyes to broadly rounded apex. Basal three antennal segments thickly dotted with black; apical two segments entirely black; length of segments 0.5–0.6; 0.6–0.7; 0.7–0.9; 0.9–1.0; 1.2–1.4 mm. Bucculae evanescent at base of head, surpassing apex of first rostral segment.

Pronotum 1.6–2.0 mm. long at meson, 2.6–2.8 times as wide at humeri. Anterolateral margins nearly straight, near apex with weak obtuse denticles, occasionally merely undulating (Fig. 207). Disk impressed submarginally along anterior and anterolateral margins, especially posterolaterad of cicatrices. Humeri weakly produced, rounded.

Scutellum usually a little longer than wide, 2.6–3.2 mm. wide at base, 2.8–3.4 mm. long; apex punctate; fovea at basal angle obscure or wanting. Membrane of hemelytra dark; veins simple. Connexiva moderately exposed, fuscous alternated with sordid yellow at middle of each segment; punctuation coarse, close, pale.

Pleural regions with five black spots on each side; spot at anterolateral angle of prothorax reduced to a few black punctures. Evaporative area unicolorous. Legs thickly spotted with black. Spiracles concolorous with supporting sclerites. Abdominal sternites black at basal angles.

Posterior margin of pygophore sinuous, convex at meson in caudal, ventral and dorsal views (Figs. 208–210). Inferior ridge prominent in caudal view, with broad deep mesial concavity, its posterior margin sinuous and convex mesially from dorsal view. Superior ridge strongly produced with deep concave mesial emargination. Black

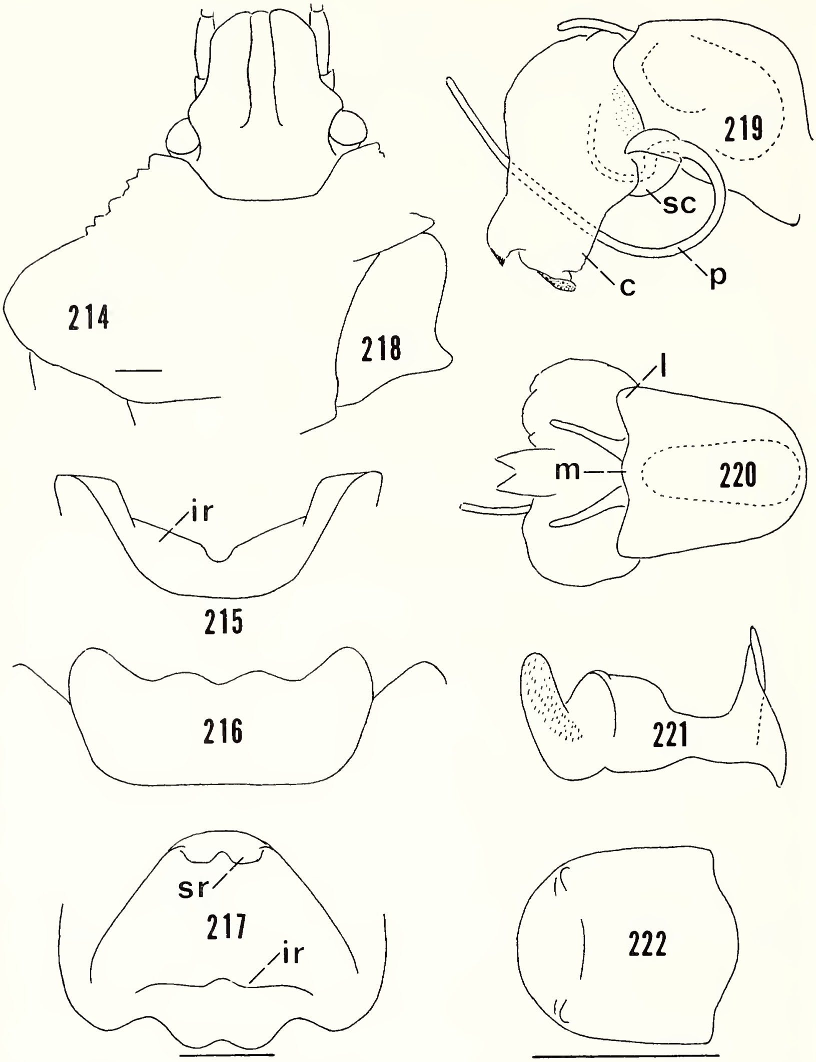


FIGS. 207–213. *E. spurculus.* Fig. 207. Pronotum. Fig. 208. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 209. Pygophore, ventral aspect. Fig. 210. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 211. Theca and related structures, lateral aspect; conjunctiva (c), thecal processes (tp). Fig. 212. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m), thecal processes (tp). Fig. 213. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

denticle on lateral walls of genital cup located near base of parameres. Thecal processes long, thin (Fig. 211). Penisfilum emerging ventrally at meson. Lobes of theca weakly produced (Fig. 212). Spatulate apex of parameres aciculate on surface opposing shallow cup (Fig. 213).

TYPE: Female, in Naturhistoriska Riksmuseum, Stockholm. Not seen.

DISTRIBUTION: From Guerrero to Chihuahua, Mexico. Reported from Arizona by Barber (1910). Apparently uncommon.



FIGS. 214–222. *E. stali*. Fig. 214. Head and pronotum. Fig. 215. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 216. Pygophore, ventral aspect. Fig. 217. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), superior ridge (sr). Fig. 218. Profile of pygophore, left lateral aspect. Fig. 219. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 220. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe

12 72

Euschistus stali, new species

Dorsum light brown; head, anterolateral and anterior borders of pronotum faintly suffused with red; punctation rather dense, fine, black along borders of head and anterolateral pronotal borders including base of denticles, otherwise castaneous shades. Ventral surfaces pale yellow, concolorously punctate, sometimes flecked with red. Length without membranes 9.1-10.8 mm.

Width and length of head subequal, 2.1–2.2 mm. wide. Lateral margins of juga subparallel for middle third of distance from eyes to apex. Juga and tylus subequal in length. Basal three antennal segments and basal fourth of last two segments pale yellow, with black dots on first three and sometimes on basal ring of fourth; apical two segments otherwise darker, immaculate; length of segments 0.5–0.6; 0.9–1.0; 0.8–1.2; 1:3; 1.4 mm. Bucculae obtusely lobed anteriorly, evanescent at base, subequal in length to first rostral segment.

Pronotum 2.1–2.5 mm. long at meson, 2.5–2.8 times as wide at humeri. Anterolateral margin nearly straight, closely denticulate along apical half; denticles pale yellow (Fig. 214). Humeri slightly produced, broadly rounded. Disk conspicuously impressed posterolaterad of cicatrices.

Scutelum as long as or a little longer than wide, 3.4–3.7 mm. wide, 3.4–4.0 mm. long; basal angles with small fovea; apex concolorous with disk, punctate. Membranes of hemelytra nearly clear; veins simple or furcate. Connexivum black along margin, fading mesad to light castaneous, alternating with pale yellow at middle of each segment; punctation close, coarse, pale.

Pleural surfaces of thorax with five black spots on each side. Numerous black dots on femora and tibiae well defined. Spiracles usually black, at least darker than surrounding surface. Dot at basal angles of abdominal sternites, sometimes pair of small submarginal mesial dots, black.

Ventral margin of pygophore produced posteriorly in lateral view (Fig. 218). Posterior margin of pygophore broadly and deeply concave in caudal view, entirely exposing concave posterior face of inferior ridge (Fig. 215), trisinuately emarginate in ventral view (Fig. 216), sinuously produced between lateral concavity on each side in dorsal view (Fig. 217). Superior ridge produced above proctiger, mesially notched. Preapical tubercles of proctiger flank broad con-

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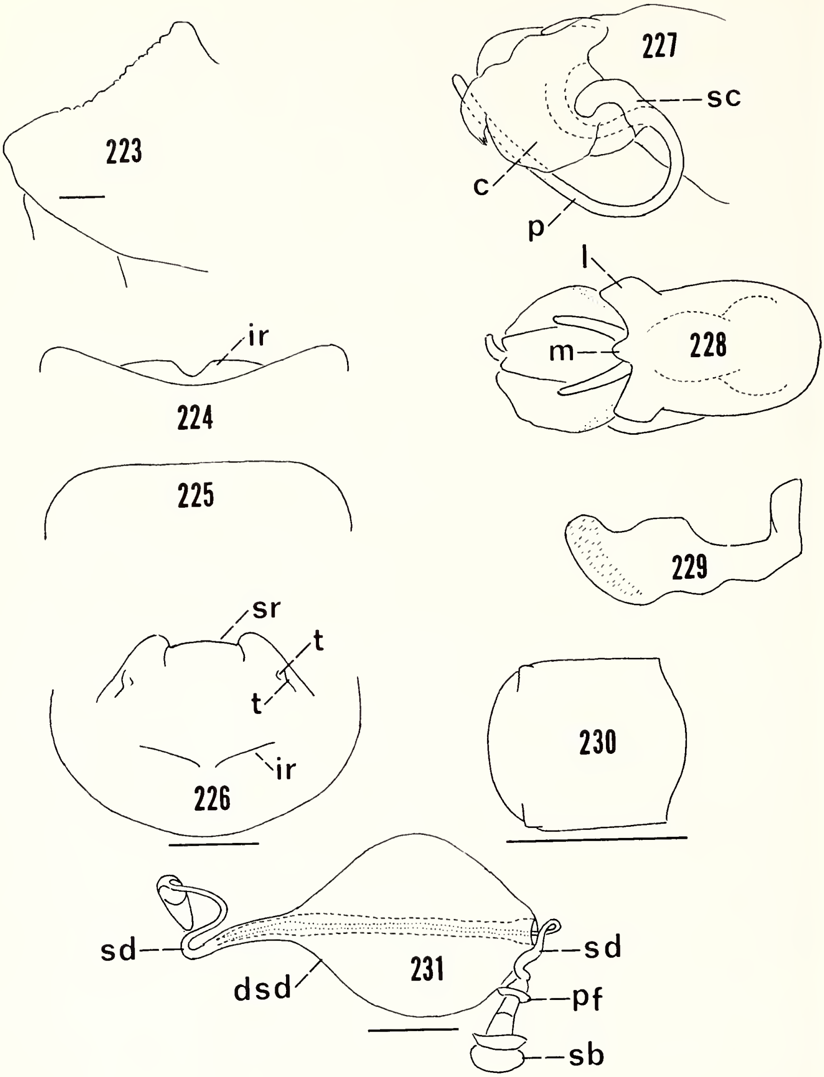
(m). Fig. 221. Right paramere, lateral aspect. Fig. 222. Proctiger. Dimensional lines equal 0.5 mm.



FIGS. 223–231. *E. egglestoni.* Fig. 223. Pronotum. Fig. 224. Posterior margin of pygophore, caudal aspect; inferior ridge (ir). Fig. 225. Posterior margin of pygophore, ventral aspect. Fig. 226. Genital cup, dorsal aspect; inferior ridge (ir), superior ridge (sr), tubercle (t). Fig. 227. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 228. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m).

cave impression (Fig. 222). Apex of parameres strongly bent, with shagreened surface (Fig. 221). Conjunctiva with two appendages on each side, one sclerotized at acute apex, other terminating in small sclerotized plate (Fig. 219). Penisfilum with sclerotized cap at base. Theca modestly lobed (Fig. 220).

HOLOTYPE: Male, labeled Mexico, Morelos, 3.6 mi. E. Cuernavaca, 4600 ft., pedregal, XI-24-65. Type no. 72128, U. S. National Museum.

PARATYPES: 3 ♂♂, 5 ♀♀. MEXICO: *Colima*: Vulcano, L. Conrad (♂ USNM, ♂ NR). *Michoacan*: Morelia, 9-22-57, R. & K. Dreisbach (♀ TAMU). *Morelos*: Cuernavaca, VII-9-61, R. & K. Dreisbach (♂, ♀ LHR); (a) Cuernavaca, X-1944 (b) on foliage *Eupatorium adenophorum* (c) N. L. H. Krauss, p. 621 (♀ BMNH). *Nayarit*: Camposella, 9-16-57, R. & K. Dreisbach (♀ MSU); (a) Jalisco, 3 mi. S. Mazamitla, V-10-1963 (b) W. J. Gertsch, W. Sire (♀ AMNH).

DISTRIBUTION: In the Mexican states of Colima, Michoacan, Morelos and Nayarit.

COMMENT: Aside from the unusual pygophore, the pale pronotal denticles with a thin line of black punctures at their base are the most conspicuous feature of this species.

STRENUUS GROUP

The three species of the *strenuus* group, *Euschistus strenuus, E. egglestoni* and *E. leonensis* may be distinguished most readily from the allied *crenator* and *sulcacitus* groups by the structure of the pronotum and the male genitalia. The anterolateral pronotal margins of the *strenuus* group are depressed before the humeri, and often the denticulate portion, including the denticles, is strikingly paler than the disk. The posterior margin of the inferior ridge, viewed dorsally, forms a very open V with the arms directed anterolaterad.

GROUP CHARACTERISTICS

Length 6.9–10.4 mm. Dorsum variously light grey to dark brown, lighter colors often suffused with pale red, occasionally with pale

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Fig. 229. Right paramere, lateral aspect. Fig. 230. Proctiger. Fig. 231. Spermatheca; dilation of spermathecal duct (dsd), proximal flange (pf), spermathecal bulb (sb), spermathecal duct (sd). Dimensional lines equal 0.5 mm.

green; punctation moderately dense, somewhat uneven, light castaneous to black; without calloused spots. Anterolateral margins of pronotum closely denticulate about two-thirds distance from apex to humeral angles, depressed before humeri; denticulate portion together with denticles often pale, contrasting strongly with disk. Costal margin of hemelytra at most weakly reflexed at very base; disk without numerous dark spots; membrane transparent, unspotted, veins simple or furcate. Ventral surfaces including evaporative areas, abdominal sutures and spiracles pale, often partially suffused with pea green, sometimes with pale red, occasionally flecked with pale red; punctation usually dark beneath humeral angles, often some dark punctures along margins of head, otherwise concolorous; thorax marked on each side with five black spots, basal angles of abdominal sternites with black dot.

Posterior margin of pygophore broadly concave in caudal view, partially exposing inferior ridge (Figs. 224, 234, 243), evenly convex in dorsal view (Figs. 226, 236, 245); posterior margin of inferior ridge forming very depressed V with arms directed anterolaterad in dorsal view. Area between inferior ridge and posterior margin of pygophore smoothly excavated; superior ridge scarcely projecting over proctiger, shallowly concave on posterior margin in dorsal aspect. Sclerotized cap at base of penisfilum large, heavily pigmented (Figs. 227, 237, 246). Small appendage on each side of conjunctiva terminating in acute sclerotized point. Lobes of theca well developed, lateral lobes expanded laterally (Figs. 228, 238, 247).

13, 14, 26

Euschistus egglestoni, new species

P. 223-231

Length without membrane 8.6–9.7 mm. for males, 9.0–10.4 mm. for females; width at humeri 5.3–6.0 mm. for males, 5.4–6.5 mm. for females; length of antennal segments (both sexes) 0.5–0.6; 0.7–0.9; 0.9–1.1; 0.9–1.1; 1.1–1.2 mm.; pronotum 2.4–2.6 times as wide at humeri as long.

Humeri little produced, broadly rounded to obtusely angulate (Fig. 223). Disk of pronotum usually divided by inconspicuous, narrow, irregular, levigate fascia; punctures similar on both sides of fascia or somewhat finer anteriorly. Dorsum brownish yellow, usually much suffused with shades of red, often bright castaneous. Tergites beneath membrane light brown to black, distinctly darker than venter.

Posterior margin of pygophore truncate from ventral view (Fig. 225); lateral walls of genital cup with obtuse denticle just below and more or less separated from rim (Fig. 226), a smaller denticle entad. Penisfilum longer than in *E. strenuus,* directed cephalad upon emerging from sclerotized cap (Fig. 227). Cephalic margin of parameres somewhat truncately produced between base and apex (Fig. 229).

Spermathecal duct of female genitalia appreciably longer between orifice and dilation than in *E. strenuus*, both looped and convolute before proximal flange (Fig. 231); spermathecal bulb depressed.

HOLOTYPE: Male, labeled (a) Durango, Durango, Mexico, Wickham (b) H. G. Barber Colln, 1950. Type no. 72122, U. S. National Museum.

PARATYPES: 13 ♂♂, 8 ♀♀. MEXICO: *Chihuahua*: 2 mi. S. Matachich, Aug. 21, 1950, Ray F. Smith (♀ AMNH); Cocomorachic, Aug. 20, 1950, Ray F. Smith (3 ♀♀, AMNH). *Colima*: 31 mi. E. Colima, VII-19-66, P. M. & P. K. Wagner (♂ TAMU); 20 mi. NE Colima VII-20-66, P. M. & P. K. Wagner (♀ LHR). *Guerrero*: 49 mi. S. Iguala, VII-12-66, P. M. & P. K. Wagner (♀ TAMU, ♀ LHR); 3 mi. S. Iguala, VII-12-66, P. M. & P. K. Wagner (♂ TAMU). *Michoacan*: 4 mi. E. Nueva Italia, VII-17-66, P. M. & P. K. Wagner (♂ LHR). *Nayarit*: 3 mi. S. Compostela, Wickham (2 ♂♂ USNM). *Sonora*: (a) Santa Cruz, X-16-45 (b) apple leaves (♀ USNM); Sonora, 9-25-52, beet tops (♂ USNM). U.S.A., *Arizona*: (a) Nogales, VIII-21-40 (b) D. J. & J. N. Knull (♀ USNM); Sabine Canyon, Sta. Catalina Mts. (♂ USNM); (a) Huachuca Mts., VIII-16-70 (b) D. J. & J. N. Knull (♂ UNLP); (a) 2 mi. NE Portal, Cochise Co., VIII-19-67 (b) J. G. Rozen, G. Krueger (♂ BMNH); (a) S.W.R.S. 5 mi. W. Portal, 5400 ft., Cochise Co., Oct. 12, 1956 (b) E. Ordway (♂ NR); Continental, VIII-13-52, W. A. Stevenson (♂ LHR).

DISTRIBUTION: From Oaxaca northward through the western Mexican states of Guerrero, Michoacan, Colima, Nayarit, Durango, Chihuahua and into Arizona.

COMMENT: This species closely resembles *E. strenuus* specimens with obtuse humeri, but the larger size of most specimens of *E. egglestoni* distinguish them from Stål's species, although there is some overlap between the two species in size. Males are readily identifiable by the relative length of the penisfilum.

This species is dedicated to the late Professor Harla Ray Eggleston, an unexcelled teacher who devoted his life to the students of Marietta College.

13,75 **Euschistus leonensis**, new species

Length 7.8–9.1 mm. for males, 7.9–9.5 mm. for females; width at humeri 5.4–7.0 mm. for males, 5.4–6.7 mm. for females; length of antennal segments (both sexes) 0.5–0.6, 0.7–0.9; 0.9–1.2; 1.0–1.2; 1.1–1.3 mm.; pronotum 2.5–3.2 times as wide as long.

Humeri produced, obtusely angulate to spinose; apex always black in spinose specimens and usually dark in specimens with obtusely angulate humeri (Figs. 232, 233). Anterolateral margin of pronotum and denticles pale yellow, contrasting with adjacent disk. Dorsum often heavily suffused with castaneous, especially in spinose specimens, with mildly to strongly contrasting light yellow or tan areas as follows: tylus, vertex of head, pronotum along meson from anterior margin posteriorly between cicatrices then laterad toward but not including humeri, scutellum except base, macula in center of disk, vague macula along each margin adjacent to inner angle of coria. Scutellum densely punctate behind frena excepting pair of longitudinal irregular impunctate or sparsely punctate fasciae separated by narrow mesial band of punctures, and usually excepting border of apex. Tergites beneath membrane light to dark castaneous, much darker than venter.

Posterior margin of pygophore shallowly concave from ventral view (Fig. 235). Lateral walls of genital cup with obsolete tubercle anterolaterad of parameres entad of obtuse, denticular swelling on rim of genital cup. Dorsal margin of parameres sinuous, cephalic margin truncately produced between base and apex (Fig. 239). Penisfilum relatively long, directed cephalad upon emerging from sclerotized cap (Fig. 237). Lateral conjunctival lobe on each side usually with faintly pigmented ventral disk.

Spermathecal duct of female genitalia quite long between orifice and membraneous enlargement, not convoluted before proximal flange (Fig. 240); spermathecal bulb nearly hemispherical.

Holotype: Male, labeled Managua-Leon Hwy. Nicaragua. 19-VI-69. Ev. Vogel, Coll. Type no. 72123, U. S. National Museum.

Paratypes: 21 males and 20 females. NICARAGUA: Leon, 18-VI-68, G. Peterson (♀, LHR); Chinandega, Baker (b) 3209 (c) P. R. Uhler Collection (♂ USNM); La Calera, Nov. 28, 1956, En tomato, F. A. Estrada (♂ USNM); No. 444-3638, Date 6-VII-64, Loc. Metapan, Col. MSU (♀ USNM); same data as holotype (♀ LHR); Altamira, Boaca, 3-XII-69 (b) Ev. Vogel (♂ LHR); Matagalpa, 26-VII-70 (b) L. H. Rolston (♀ LHR); Tipitapa, Managua, 20-VII-70 (b) L. H. Rolston, (♂ LHR); El Paso, Penaloya, Grenada, 20-VI-1970, Weeds, Ev. Vogel (♀ LHR); Santa Rita, Managua, 22-VII-70 (b) L. H. Rolston (♀ NMW, ♂ LHR); Jiloa, Managua, 2-VII-70 (b) L. H. Rolston (♀ MHB); Altamira, Managua, Nov-Dec, 1970 E. Moore (♂ MHB); Peña Blanca, Rivas, 24-VII-70 (b) L. H.

Rolston, (♂ NMW); Posoltega, Chinandega, 23-VII-70 On Sesame (b) L. H. Rolston (♂ LHR, ♂ AMNH, ♂ LSU); Los Brasiles, Managua, 19-VII-70 (b) L. H. Rolston (♂ LHR, ♂ TAMU); La Calera, Managua, 21-VII-70 (b) L. H. Rolston (♀ TAMU, ♀ AMNH); Peña Blanca, Rivas, 24-VII-70 (b) L. H. Rolston (♂ CAS, ♂ BMNH, ♂ LHR); Nagarote, Leon, 22-VII-70 (b) L. H. Rolston (♂, ♀ OSU, ♂, ♀ MSU, ♂ UNLP); Leon, Leon, 23-VII-70 (b) L. H. Rolston (♀ AMNH, ♀ LSU, ♀ CAS, 2 ♀♀ BMNH, ♂, ♀ ICN, ♂, ♀ NR, ♂, ♀ UZM, ♀ UNLP).

DISTRIBUTION: Costa Rica, Nicaragua, Honduras. Specimens from Honduras and Costa Rica were seen only recently and are not included among the paratypes.

COMMENT: This species is common in western Nicaragua, infesting various weeds and occasionally the seed or fruit of cultivated crops. The entire ventral surface is a bright green in life, gradually turning yellow in pinned specimens. Individuals with spinose humeri are the most common, numbering 33 of 42 specimens examined.

13 **Euschistus strenuus** Stål, 1862

Euschistus strenuus Stål, 1862, p. 100.—Distant, 1880, p. 60, Pl. 5 fig. 16 (type figured).

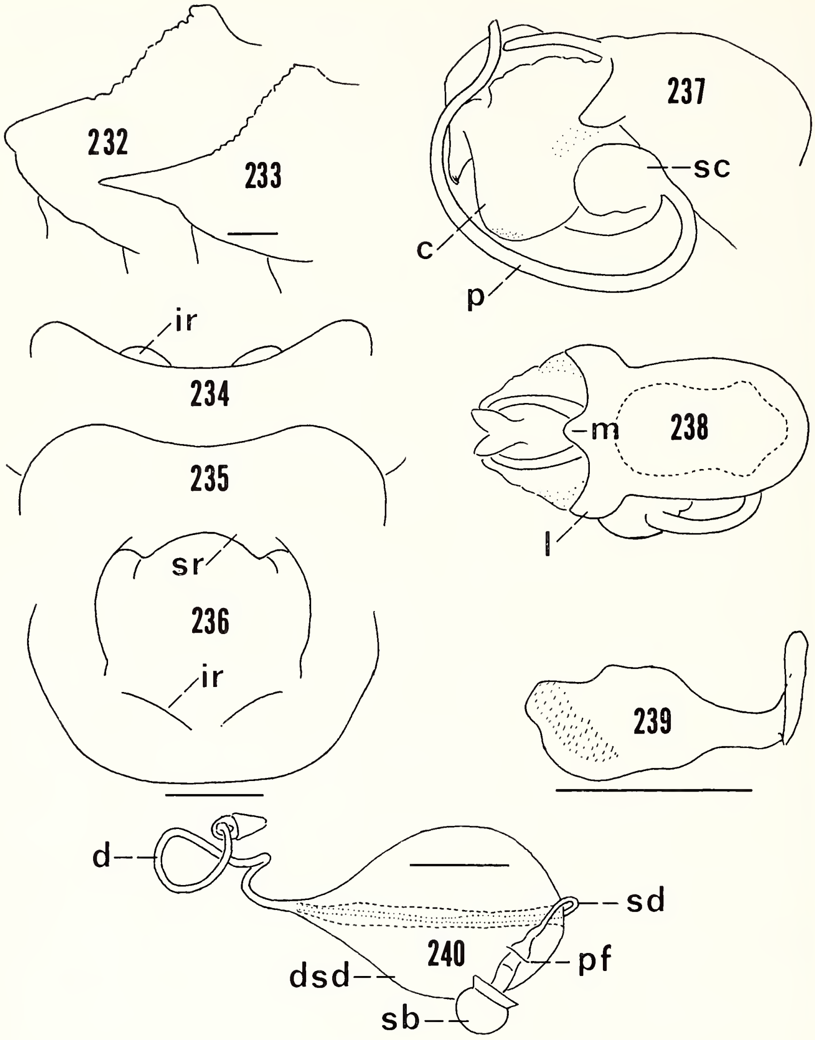
Euschistus zopilotensis Distant, 1890, p. 330, Pl. 31 fig. 9.—Ancona, 1933, p. 103 (morphology).—Van Duzee, 1904, p. 48 (record). **New Synonymy.**

Length without membrane 6.9–8.7 mm. for males, 8.0–9.1 mm. for females; width at humeri 4.7–5.8 mm. for males, 5.0–5.9 mm. for females; length of antennal segments (both sexes) 0.5–0.6; 0.6–0.8; 0.9–1.2; 0.9–1.3; 1.1–1.3 mm.; pronotum 2.5–2.9 times as wide as long.

Humeri slightly produced and bluntly rounded to moderately produced and spinose (Figs. 241–242), palely colored with yellow, brown or red, never black. Vague broad fascia, more sparcely punctate and prominently to obscurely paler than adjacent surfaces, frequently running transversely from humeri to meson, there curving cephalad, passing between cicatrices and continuing along meson of head to apex of tylus.

Posterior margin of pygophore truncate from ventral view (Fig. 244); lateral walls of genital cup with small denticle entad of obtuse, rather obscure production on rim of genital cup (Fig. 245). Penisfilum short, curving basad upon emerging from sclerotized cap (Fig. 246). Cephalic margin of parameres smoothly convex (Fig. 248).

Spermathecal duct of female genitalia quite short from orifice to



FIGS. 232–240. *E. leonensis.* Figs. 232–233. Variation in humeral angle. Fig. 234. Posterior margin of pygophore, caudal aspect; inferior ridge (ir). Fig. 235. Posterior margin of pygophore, ventral aspect. Fig. 236. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), superior ridge (sr). Fig. 237. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 238. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 239. Right paramere,

dilation, looped but not convolute before proximal flange (Fig. 250); spermathecal bulb nearly hemispherical.

Type: Female, in Signoret collection, Naturhistorisches Museum, Vienna, Austria. Stål gave the width of the type as 4 mm., but Dr. R. C. Froeschner found the specimen to measure 5.2 mm. at the humeri, a figure in agreement with Distant's dimensional diagram beside his illustration of the type.

Synonymy: Distant in his description of *E. zopilotensis* stated: "In structure and shape allied to *E. strenuus* Stål, but with the pronotal angles subprominent and obtusely rounded, not prominent and subacute; the lateral margins of the pronotum are not levigate as in Stål's species, and the colour is also different." All of these characters prove to be variable, and the genitalia of the form described by Stål and that of Distant's syntypes appear identical. The color of the tergites beneath the membrane correlate with the form of the humeri, however. Of 54 speciments with bluntly rounded to obtusely angulate humeri, the tergites of 52 (96%) were light brown to black and darker than the venter; of 37 specimens with acute to spinose humeri, the tergites of only 12 (32%) were similarly colored.

One of Distant's 10 syntypes, a female, is not conspecific with the other syntypes. This specimen bears a 'type' label, presumably added later since Distant did not designate type specimens. Although the specimen bears only a superficial resemblance to the other syntypes, it is probably the object of Distant's comment that ". . . in some specimens the punctures become confluent and form irregular spots and patches of black."

The syntypic specimens of *Euschistus zopilotensis* Distant, 1890, consist of 7♂♂ and 2♀♀. From these the following is designated the lectotype:

♂, labeled (a) Venta de Zopilote, Guerrero, 2800 ft. June, H. H. Smith (b) Distant Coll. 1911-383.

Six ♂♂ and 2 ♀♀ are designated paralectotypes:

1-3. ♂♂, (a) Venta de Zopilote, Guerrero, 2800 ft. Oct. H. H. Smith (b) B.C.A. Hem. I, *Euschistus zopilotensis*.

4-5. ♂ and ♀, (a) Venta de Zopilote, Guerrero, 2800 ft. June. H. H. Smith (b) Distant Coll. 1911-383.

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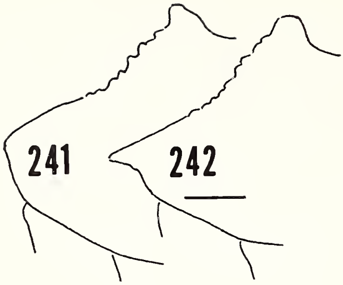
lateral aspect. Fig. 240. Spermatheca; dilation of spermathecal duct (dsd), proximal flange (pf), spermathecal bulb (sb), spermathecal duct (sd). Dimensional lines equal 0.5 mm.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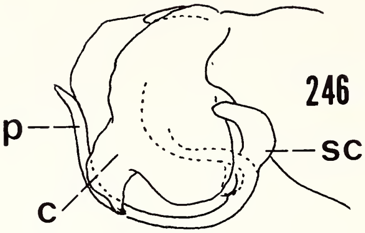
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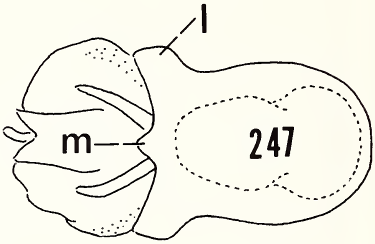
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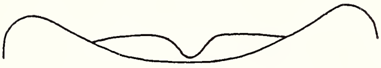
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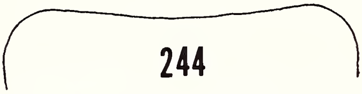
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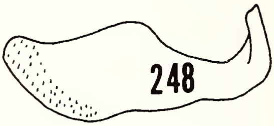
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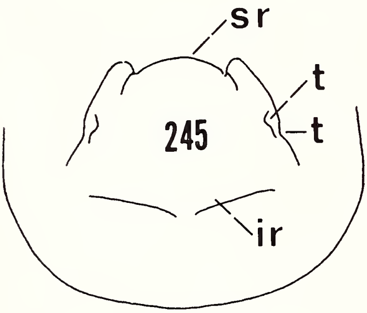
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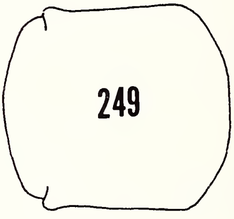
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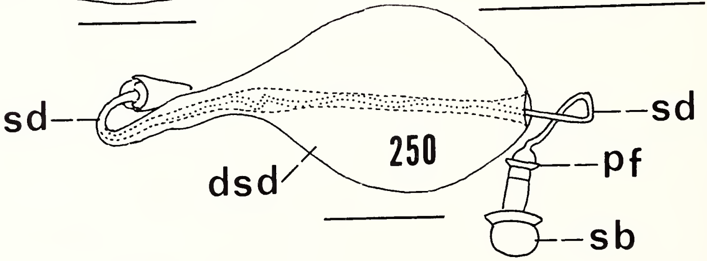
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6. ♀, (a) Venta de Zopilote, Guerrero, 2800 ft. Oct. H. H. Smith (b) Distant Coll. 1911-383.
7. ♂, (a) Chilpancingo, Guerrero, 4600 ft. July. H. H. Smith (b) B.C.A. Hem. I, *Euschistus zopilotensis*.
8. ♂, (a) *zopilotensis* Dist. (b) Cuernavaca, Morelos, June. H. H. Smith (c) Distant Coll. 1911-383.

All types are in the British Museum (Natural History) London.

Euschistus subinteger, new species

Yellowish brown above; moderately, rather regularly and lightly punctate with castaneous to black. Sordid yellow ventrally, concolorously punctate. Length 9.5 mm.

Head nearly as long as broad, 2.1–2.2 mm. wide across eyes; juga about as long as tylus, lateral margins tapering slightly from concavity before eyes to moderately rounded apex of head. Antennae finely dotted with fuscous on four basal segments (fifth wanting), segments 0.5; 0.9; 1.2; 1.5; ? mm. long. Bucculae evanescent at base of head, subequal in length to basal segment of rostrum.

Pronotum 2.1–2.4 mm. long at meson, 2.4–2.5 times as wide at humeri. Anterolateral margins straight, undulating or obscurely denticulate near apex, with or without denticle at anterolateral angle, anterior half or more slightly reflexed and with narrow impunctate border (Fig. 251). Humeri modestly produced, right angular. Disk shallowly impressed posterolaterad of cicatrices.

Scutellum subequal in length and breadth, 3.1–3.6 mm. wide at

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FIGS. 241–250. *E. strenuus*. Figs. 241–242. Variation in humeral angles. Fig. 243. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 244. Posterior margin of pygophore, ventral aspect. Fig. 245. Genital cup, dorsal aspect, omitting parameres and proctiger; inferior ridge (ir), superior ridge (sr), tubercle (t). Fig. 246. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 247. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 248. Right paramere, lateral aspect. Fig. 249. Proctiger. Fig. 250. Spermatheca; dilation of spermathecal duct (dsd), proximal flange (pf), spermathecal bulb (sb), spermathecal duct (sd). Dimensional lines equal 0.5 mm.

base; basal angles with cluster of a few black punctures; apex indistinctly pale margined; punctation of disk uniform to somewhat irregular with a few lacunae and spots of accretive black punctures. Membrane of hemelytra frosty hyaline; veins simple or furcate, brownish. Connexiva alternated, brownish yellow with black band bordering sutures on each side. Tergites black.

Pleural surfaces on each side with five black spots, otherwise unmarked. Femora, sometimes tibiae also, sparsely black spotted. Margins of abdominal venter black at both basal and apical angles. Spiracles concolorous with sternites.

Pygophore with broad, moderately deep, mesial emargination of posterior margin in ventral and dorsal views (Figs. 253, 254); sinuously concave in caudal view with broad median concavity flanked on each side by lesser concavity (Fig. 252). Inferior ridge apparently incorporated into posterior margin of pygophore, forming thin mesial portion; lateral walls of genital cup adorned with series of subvertical black rugae becoming denticulate entad. Superior ridge notched mesially. Preapical tubercles on proctiger well developed (Fig. 255). Parameres shallowly cupped, terminating in simple hook with slightly roughened area on inner face (Fig. 258). Two small appendages on each side of conjunctiva, both sclerotized at acute apex (Fig. 256). Penisfilum with annular sclerotized cap at base. Lateral lobes of theca prominent, surpassing median lobe (Fig. 257).

HOLOTYPE: Female, labeled, Mexico, Tepic, 22 Aug. 1905, P. H. Goldsmith. Deposited in American Museum of Natural History.

PARATYPE: Male, Mexico, Oaxaca nr. Totolapan, Aug. 5, 1965, Flint & Ortiz (USNM).

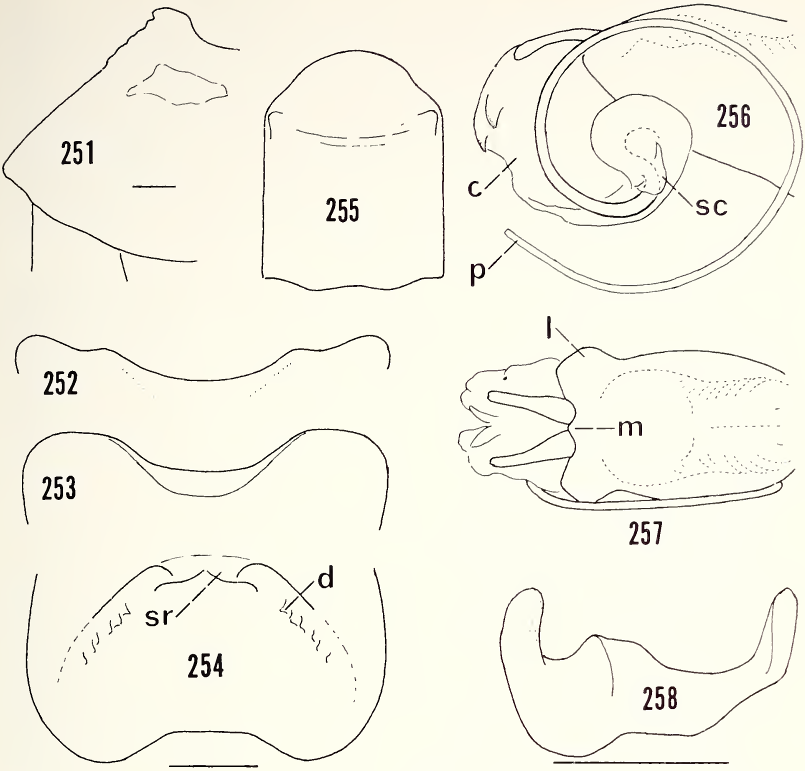
DISTRIBUTION: Mexican states of Oaxaca and Nayarit.

COMMENT: This species closely resembles *E. integer* but, in addition to the distinctive male genitalia, differs in having the anterolateral margins of the pronotum quite straight and the humeri angulate, while in *E. integer* the margin is usually slightly arcuate and completely smooth, and the humeri are always rounded.

The paratype is unfortunately in poor condition, lacking all the antennae except one basal segment and most of the legs.

SULCACITUS GROUP

The *sulcacitus* group consists of four species: *Euschistus corcovacitus, E. olacitus, E. palacitus* and *E. sulcacitus.* Their nearest relatives are the species comprising the *crenator* group and the *strenuus* group.



Figs. 251–258. *E. subinteger.* Fig. 251. Pronotum. Fig. 252. Posterior margin of pygophore, caudal aspect. Fig. 253. Posterior margin of pygophore, ventral aspect. Fig. 254. Genital cup, dorsal aspect; denticles (d), superior ridge (sr). Fig. 255. Proctiger. Fig. 256. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 257. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Fig. 258. Right paramere. Dimensional lines equal 2.5 mm.

GROUP CHARACTERISTICS

Relatively small, males 7.7–9.1 mm. long. Punctation of dorsum rather uniform, moderately dense, castaneous, usually darker along lateral margins of head, becoming black along anterolateral pronotal margin, without impunctate fascia or calloused spots. Anterolateral pronotal margins closely denticulate about three-fifths distance from apex to humeral angles with punctures encroaching between and sometimes onto base of denticles; humeral angles narrowly rounded (Fig. 259), usually slightly elevated in transverse profile (Fig. 260), generally tinged with red. Costal margin of hemelytra not reflexed, disk without dark spots, membrane unspotted, vitreous or nearly so; veins simple or furcate. Ventral surfaces including evaporative areas, abdominal sutures and spiracles, pale excepting five black spots on each side of thorax and black spot at basal angles of abdominal sternites; punctation concolorous.

Posterior margin of inferior ridge, viewed dorsally, forming shallow concave arc (Figs. 263, 271, 277, 283). Superior ridge sinuously produced above proctiger (Fig. 264). Penisfilum with sclerotized cap at base. Appendage on each side of conjunctiva sclerotized and acute at apex (Figs. 266, 273, 279, 285). Lateral lobes of theca produced little or not at all laterally (Figs. 267, 274, 280, 286).

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Euschistus corcovacitus Rolston, 1971

Euschistus corcovacitus Rolston, 1971, p. 486.

Posterior margin of pygophore shallowly concave and sinuous in caudal view (Fig. 261), somewhat protruding mesially in ventral view (Fig. 262), convexly arcuate in dorsal view (Fig. 263). Area behind inferior ridge smoothly excavated excepting low broad mesial protuberance. Carina on lateral walls of genital cup with small black obtuse denticle anterolaterad of parameres. Parameres broadly rounded at apex of obovate shagreened area (Fig. 265).

Type: Male, in American Museum of Natural History.

Distribution: Costa Rica, Guatemala, Honduras, and Chiapas, Mexico.

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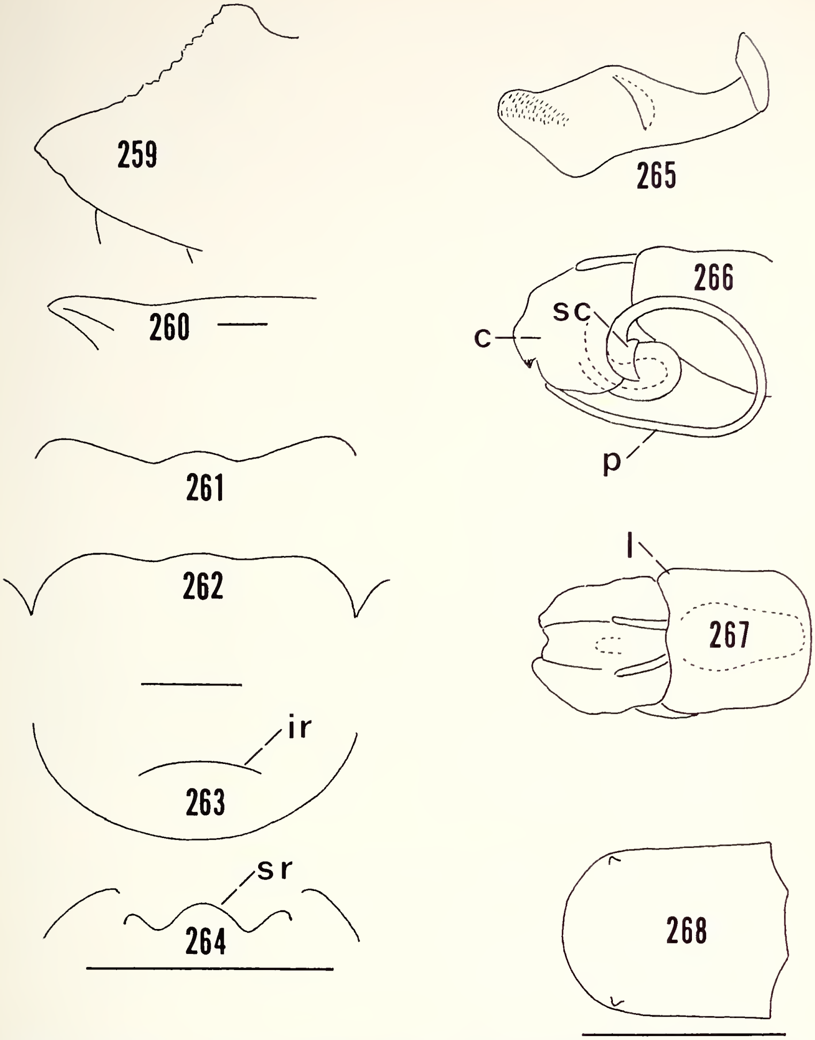
Euschistus olacitus Rolston, 1971

269-270

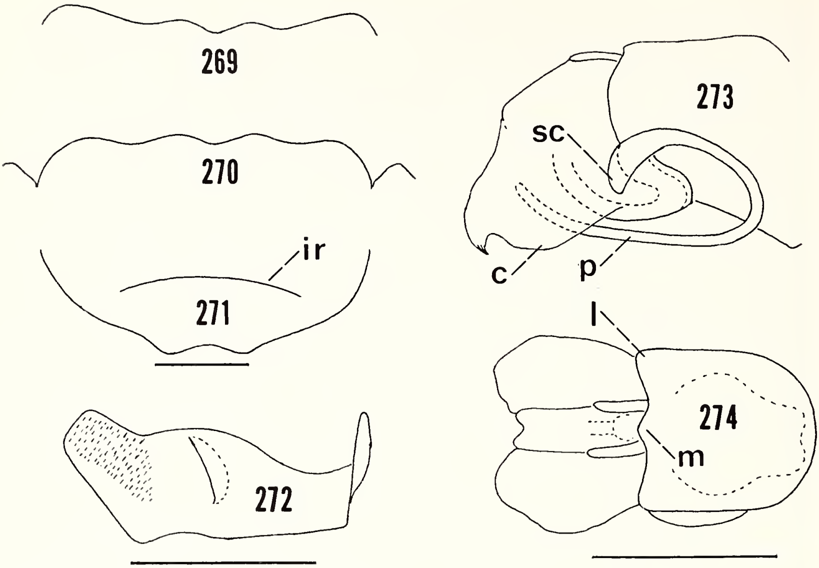
Euschistus olacitus Rolston, 1971, p. 486.

Posterior margin of pygophore slightly concave and conspicuously sinuous in caudal view (Fig. 269), quite sinuous in ventral view (Fig. 270), convexly arcuate with sinuous mesial protuberance in dorsal view (Fig. 271). Area behind inferior ridge smoothly excavated. Black percurrent carina on lateral walls of genital cup anterolaterad of parameres. Parameres truncate at apex of subtrapezoidal shagreened area (Fig. 272).

Type: Male, Type No. 71965, U. S. National Museum.



FIGS. 259–268. *E. corcovacitus.* Fig. 259. Pronotum. Fig. 260. Dorsal profile of pronotum, cephalic aspect. Fig. 261. Posterior margin of pygophore, caudal aspect. Fig. 262. Posterior margin of pygophore, ventral aspect. Fig. 263. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 264. Posterior margin of superior ridge (sr). Fig. 265. Right paramere, lateral aspect. Fig. 266. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 267. Theca and related structures, dorsal view. Fig. 268. Proctiger. Dimensional lines equal 0.5 mm.



Figs. 269–274. *E. olacitus.* Fig. 269. Posterior margin of pygophore, caudal aspect. Fig. 270. Posterior margin of pygophore, ventral aspect. Fig. 271. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 272. Right paramere, lateral aspect. Fig. 273. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 274. Theca and related structures, dorsal aspect; lateral lobes (l), median lobe (m). Dimensional lines equal 0.5 mm.

Distribution: In Mexican states of Hidalgo, Oaxaca, San Luis Potosí and Vera Cruz.

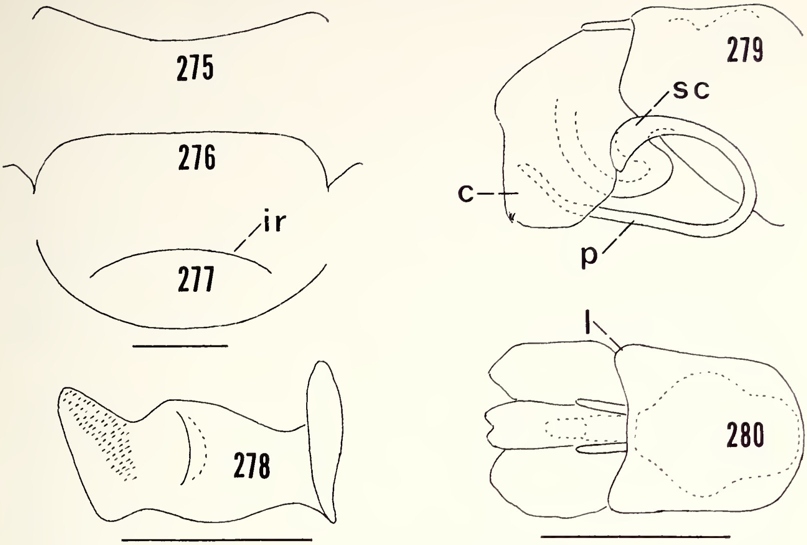
Euschistus palacitus Rolston, 1971

Euschistus palacitus Rolston, 1971, p. 487.

Posterior margin of pygophore concavely arcuate in caudal view (Fig. 275), nearly straight in ventral view (Fig. 276), convexly arcuate in dorsal view (Fig. 277). Genital cup smoothly excavated between inferior ridge and posterior margin of pygophore. Small black denticle anterolaterad of parameres on carina of lateral walls of genital cup. Parameres toward apex bent laterad, appearing abbreviated in lateral view (Fig. 278).

Type: Male, in American Museum of Natural History.

Distribution: Guatemala.



FIGS. 275–280. *E. palacitus.* Fig. 275. Posterior margin of pygophore, caudal aspect. Fig. 276. Posterior margin of pygophore, ventral aspect. Fig. 277. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 278. Right paramere, lateral aspect. Fig. 279. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 280. Theca and related structures, dorsal aspect; lateral lobes (l). Dimensional lines equal 0.5 mm.

Euschistus sulcacitus Rolston, 1971

Euschistus sulcacitus Rolston, 1971, p. 488.

Posterior margin of pygophore with broad shallow notch in caudal view (Fig. 281), slightly sinuous in ventral view (Fig. 282), convexly arcuate in dorsal view (Fig. 283). Broad mesial sulcus in excavation behind inferior ridge flanked by slight thickening of posterior margin of pygophore. Carina on lateral walls of genital cup with small black denticle anterolaterad of parameres. Parameres broadly rounded at apex of elongated shagreened area (Fig. 284). Penisfilum appreciably longer than in other species of group (Fig. 285).

TYPE: Male, Type No. 71966, U. S. National Museum.

DISTRIBUTION: Guatemala to Mexican state of San Luis Potosí.

Euschistus tristigmus (Say), 1832

Pentatoma tristigma Say, 1832, p. 4.—Say, 1859, p. 314.
Pentatoma inconspectus [Westwood], 1837, p. 42.
Cimex pyrrhocera Herrich-Schaeffer, 1841, p. 42, fig. 638.
Pentatoma tristigma Herrich-Schaeffer, 1844, pp. 95, 101, fig. 767 (as new species).
Euschistus luridus Dallas, 1851, p. 207, Pl. 7 fig. 6.
Euschistus tristigma: Dallas, 1851, p. 207.
Euschistus tristigmus: Stål, 1872, p. 26.—Distant, 1880, p. 58, Pl. 5 figs. 20, 21.—Van Duzee, 1904, p. 47.—Blatchley, 1926, p. 134 (description).—Woodside, 1946, p. 161 (biology).—Esselbaugh, 1949, p. 160 (biology).—McDonald, 1966, p. 28, figs. 246–250, 452 (genitalia).—Schaefer, 1968, p. 89 (female genitalia).—McPherson, 1971, p. 1339 (biology).
Euschistus tristigmus luridus: Blatchley, 1926, p. 136.
Euschistus tristigmus pyrrhoceus: Van Duzee, 1904, p. 47 (as variety).—Kirkaldy, 1909, p. 67 (as variety).—Blatchley, 1926, p. 137.

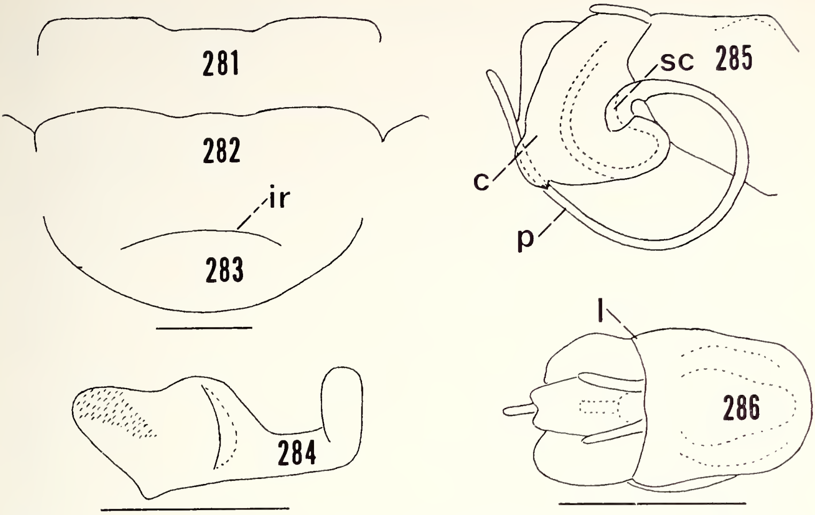
Light brown to fuscous above, thickly and rather uniformly punctate with castaneous to black, ventral surfaces sordid white to pale yellow, concolorously punctate or with some punctures and flecks of pale red. Length 9.2–12.3 mm.

Width of head equal to or slightly greater than length, 2.0–2.5 mm. across eyes; lateral margins subparallel for middle third of distance from eyes to broadly rounded apex; disk nearly flat. Antennae pale yellow to rufous, rarely fuscous on apical half of fourth and all of fifth segments; often basal segment, occasionally second and third also, sparsely marked with faint dark dots; length of segments 0.6–0.7; 0.7–1.1; 1.0–1.5; 1.2–1.6; 1.4–1.7 mm. Bucculae evanescent at base of head.

Pronotum 2.0–3.0 mm. long at meson, 2.6–3.1 times as wide at humeri. Apical half of anterolateral margins closely denticulate; denticles concolorous with or somewhat paler than disk; submarginal punctation especially dense. Humeri moderately to strongly produced, obtusely rounded to acute, slightly to moderately elevated (Figs. 287, 288).

Width and length of scutellum subequal, 3.1–4.4 mm. wide at base; basal angles with small fovea; apex narrowly rounded, sometimes narrowly impunctate and flavous. Membrane of hemelytra hyaline, with numerous brownish spots; veins simple, with little or no color. Connexiva fuscous to black, alternated with sordid white to orange brown at middle of each segment.

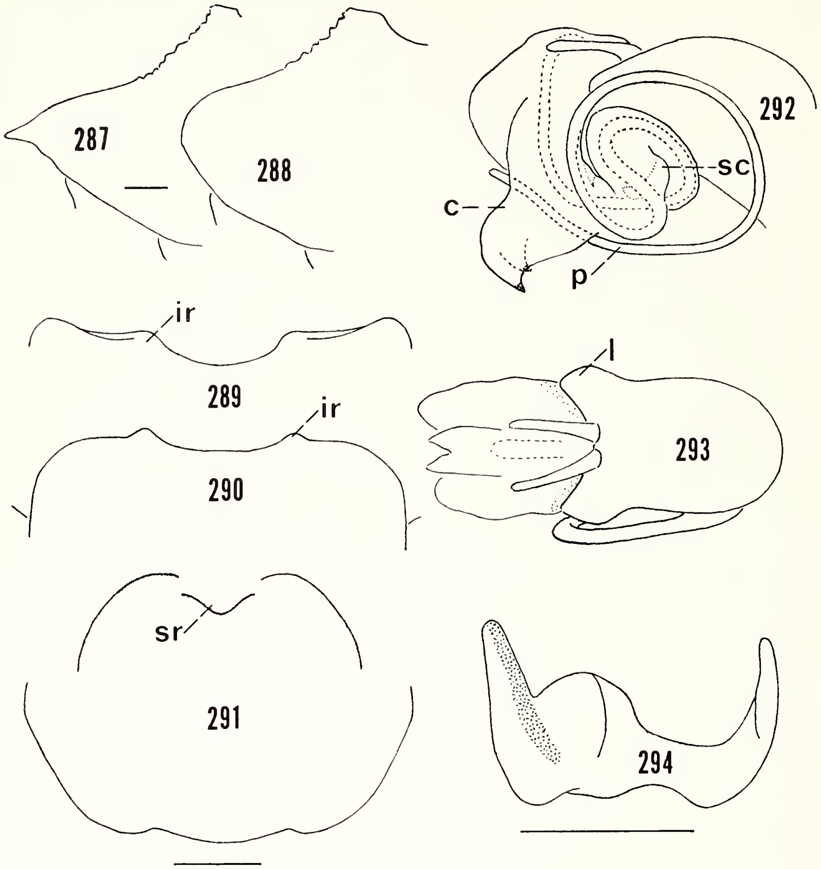
Pleural surfaces on each side with five black spots. Mesosternum with fuscous macula at base of each coxa, anterior pair rarely want-



FIGS. 281–286. *E. sulcacitus*. Fig. 281. Posterior margin of pygophore, caudal aspect. Fig. 282. Posterior margin of pygophore, ventral aspect. Fig. 283. Posterior margin of pygophore and of inferior ridge (ir), dorsal aspect. Fig. 284. Right paramere, lateral aspect. Fig. 285. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 286. Theca and related structures, dorsal aspect; lateral lobes (l). Dimensional lines equal 0.5 mm.

ing. Legs rather thinly spotted with blackish dots of various sizes, some grouped on femora in vague preapical ring. Evaporative areas not contrastingly punctate, occasionally flecked with pale red. Spiracles concolorous with supporting sclerites. Lateral margins of abdomen dotted with black at basal angles of each sternite, less extensively so at apical angles. Elongate black median macula on fifth sternite, rarely faded to obscurity, usually accompanied by similar macula on each of one to three preceding sternites.

Inferior ridge forms angular U open at posterior margin of pygophore, its apices in caudal view appearing as ridges dividing posterior margin of pygophore into three concave parts (Fig. 289), protruding slightly from ventral view, interrupting shallowly concave posterior margin of pygophore (Fig. 290). Superior ridge produced posteriorly above proctiger into mesial, entire, occasionally quite prolonged tubercle (Fig. 291). Conjunctiva with two appendages on each side, both acute and sclerotized at apex (Fig. 292). Penisfilum coiled, making about one and one half loops, with sclerotized cap



FIGS. 287–294. *E. tristigmus.* Figs. 287–288. Variation in humeral angle. Fig. 289. Posterior margin of pygophore and dorsal margin of inferior ridge (ir), caudal aspect. Fig. 290. Posterior margin of pygophore, ventral aspect; inferior ridge (ir). Fig. 291. Outline of genital cup, dorsal aspect; superior ridge (sr). Fig. 292. Theca and related structures, lateral aspect; conjunctiva (c), penisfilum (p), sclerotized cap (sc). Fig. 293. Theca and related structures, dorsal aspect; lateral lobes (l). Fig. 294. Right paramere, lateral aspect.

at base. Lateral lobes of theca prominent (Fig. 293). Apex of parameres strongly bent in lateral view, rather acute, reticulate on cephalic surface (Fig. 294).

TYPE: The type of *E. tristigmus* is apparently lost. The type of *E. luridus* Dallas was examined.

DISTRIBUTION: Primarily a northern species but may occur in northern Mexico.

12, 77

Euschistus vetus, new species

Yellowish brown above with broad, light suffusion of red on head and lateral borders of pronotum and hemelytra. Margins of head before eyes thinly edged with black. Narrow black band composed of black punctures along denticulate portion of pronotum continuing onto humeral angles as nearly solid line with diffuse inner boundary; punctation rather evenly distributed, moderately dense, fuscous. Ventral surfaces paler than dorsum, concolorously punctate. Length 9.1–10.3 mm.

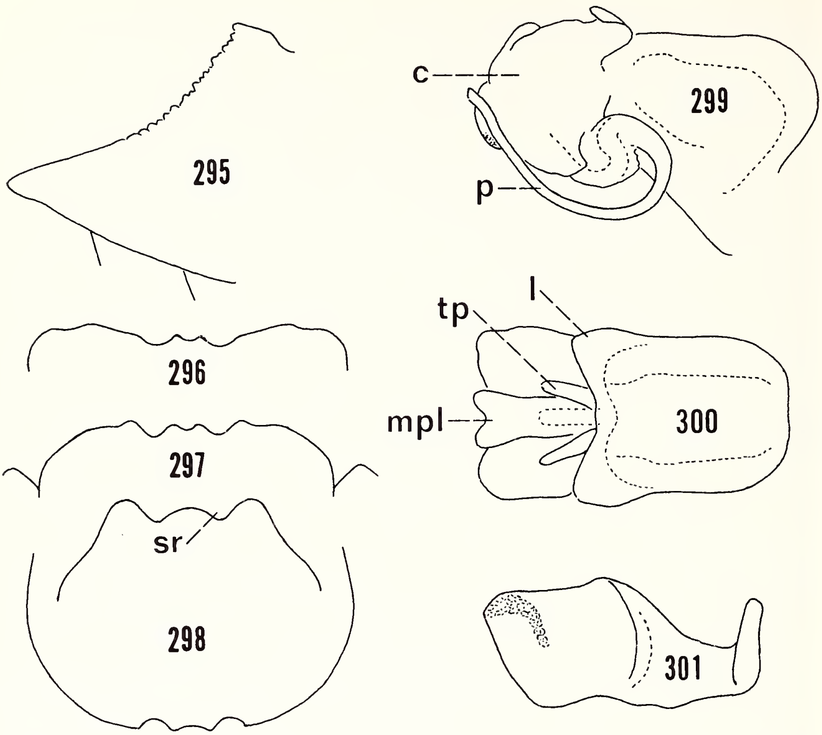
Length and breadth of head through eyes subequal, 1.9–2.1 mm. wide; apex of head narrowly rounded, tylus and juga subequal in length; lateral margins of juga subparallel for about middle third of distance from eyes to apex. Basal segment of antennae reaching apex of head; length of segments 0.5–0.7; 0.7–1.0; 1.2–1.5; 1.4–1.7; 1.4–1.8 mm.; entirely brown, sometimes paler toward base of last two segments, variably dotted with light fuscous on basal or three basal segments. Bucculae evanescent at base of head, subequal in length to basal segment of rostrum.

Pronotum 2.2–2.6 mm. long at meson, 2.6–3.1 times as wide at humeri. Anterolateral margins concavely arcuate, closely denticulate nearly to humeral angles (Fig. 295); denticles black in whole or part. Humeral angles rather strongly produced laterad, rising toward apex, spinose.

Scutellar width and length subequal, 3.5–3.8 mm. wide at base; basal disk transversely rugose, sometimes moderately tumose; basal fovea in each angle small, consisting of a few confluent punctures, usually no darker than other punctures of scutellum; apex not differentially colored, punctation a little finer than on remainder of scutellum. Membranes of hemelytra slightly fumose; veins simple or furcate. Connexiva narrow to moderately wide, narrowly bordered with black except in middle of each segment, slightly serrate; punctation dense, shallow, rather fine.

Pleural surfaces with five small black spots on each side, that beneath apical pronotal angle minute, sometimes absent. Evaporative areas uniformly colored. Small fuscous spots numerous on femora and tibiae. Basal angles of abdominal sternites marked with elongated black spot; apical angles minutely blackened at very apex. Spiracles concolorous with supporting sclerite.

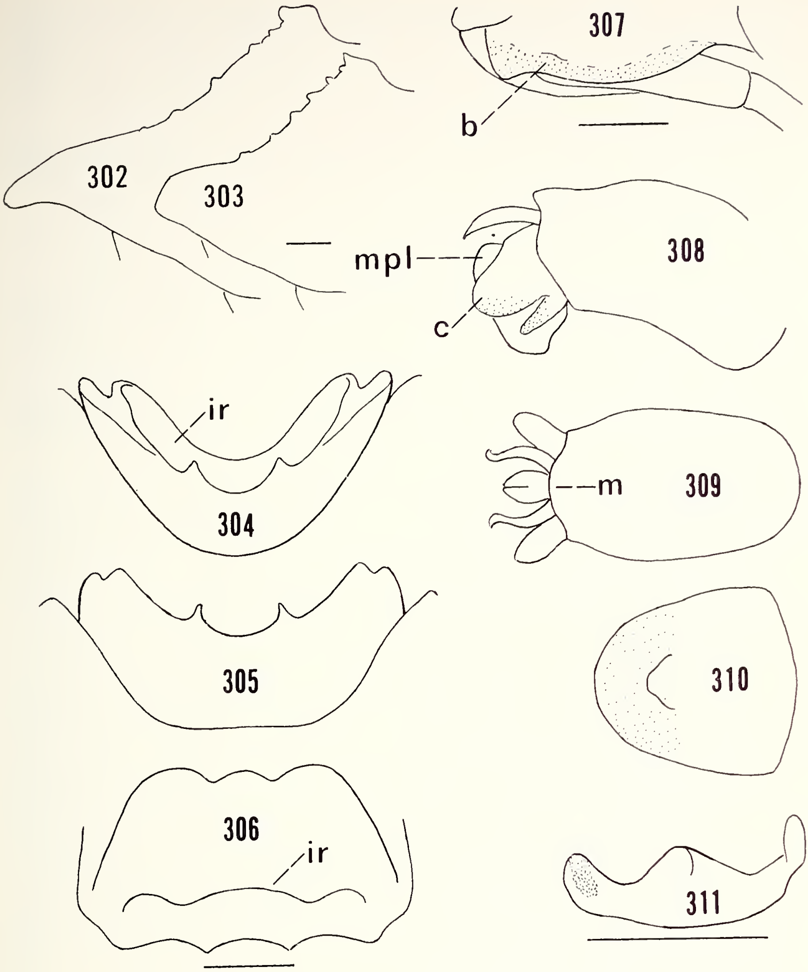
Narrow shallow median emargination of posterior margin of



FIGS. 295–301. *E. vetus.* Fig. 295. Pronotum. Fig. 296. Posterior margin of pygophore, caudal aspect. Fig. 297. Posterior margin of pygophore, ventral aspect. Fig. 298. Genital cup, dorsal aspect, with proctiger and parameres removed; superior ridge (sr). Fig. 299. Theca and related structures, right lateral aspect; conjunctiva (c), penisfilum (p). Fig. 300. Theca and related structures, dorsal aspect; lateral lobes (l), median penal lobes (mpl), thecal processes (tp). Fig. 301. Right paramere, lateral aspect.

pygophore flanked on each side by somewhat deeper emargination (Figs. 296–298). Appendage on each side of conjunctiva sclerotized at apex (Fig. 299). Penisfilum without clearly defined sclerotized cap. Lateral lobes of theca well developed, median lobe obscure (Fig. 300). Thecal processes rather short, about half as long as median penal lobes. Paramere moderately cupped, with reticulate ridge on lateral apical surface (Fig. 301).

HOLOTYPE: Male, labeled, (a) La Fuente, Costa Rica, VIII-20-1929, A. Alfaro (b) J. C. Lutz Collection, 1961. Basal



FIGS. 302–311. *E. zafadus.* Figs. 302–303. Variation in humeral angle. Fig. 304. Posterior margin of pygophore, caudal aspect; inferior ridge (ir). Fig. 305. Pygophore, ventral aspect. Fig. 306. Genital cup, dorsal aspect, with proctiger and parameres removed. Fig. 307. Bucculae (b) and basal segment of rostrum. Fig. 308. Theca and related structures, right lateral aspect; conjunctiva (c) median penal lobes (mpl). Fig. 309. Theca and related structures, dorsal aspect; median lobe (m). Fig. 310. Proctiger. Fig. 311. Right paramere, lateral aspect. Dimensional lines equal 0.5 mm.

margin of pronotum deformed on right side. Type No. 72130. U. S. National Museum.

PARATYPES: 3♀♀, same data as holotype (USNM, TAMU, LHR).

DISTRIBUTION: Costa Rica.

COMMENT: This species is much like large specimens of the *crenator* group that have acute humeral angles.

Euschistus zafadus, new species

Dark rusty brown above, shading to fuscous along anterolateral margins of pronotum and on head; punctation rather dense and coarse, especially on pronotum and scutellum. Pale orange brown beneath; rather sparsely punctate with castaneous to fuscous, with large black median spot on each of last three or four abdominal sternites.

Width of head through eyes and length subequal, 1.9–2.2 mm.; apex somewhat truncate, tylus and juga individually rounded, subequal in length; lateral margins of juga subparallel for middle third of distance from eyes to apex; disk rugosely punctate. Basal segment of antennae sordid yellow streaked with fuscous on lateral surface; remaining segments fuscous excepting sordid yellow at joints and on basal fourth of last segment; length of segments 0.5–0.7; 0.9–1.2; 1.0–1.4; 1.5–2.0; 1.7–2.0 mm.; basal segment reaching apex of head. Bucculae evanescent at base of head; basal segment of rostrum surpassing bucculae by about width of segment at apex (Fig. 307).

Pronotum 2.3–2.9 mm. long at meson, 2.7–3.1 times as wide at humeri. Denticles along anterolateral margins fuscous, as few as four on one side but usually 6–9. Humeri strongly produced laterad, rising well above disk, curving caudad near apex, with polished, yellowish, narrowly rounded apex (Fig. 302); or moderately produced, little elevated, with apical marking much reduced (Fig. 303); disk usually divided along meson by thin ruga of paler color.

Scutellum subequal in length and width, 3.2–4.1 mm. across base; small fovea in each basal angle subtriangular; apex slightly reflexed on each side of median depression. Membrane of hemelytra brown; veins simple or furcate; pale subcalloused spot located at distal end of radial vein on coria. Connexiva moderately exposed, fuscous alternated with pale spots concolorous with venter, these spots in middle of each segment along lateral border and becoming progressively larger toward apex of abdomen.

Pleura with black spot at base of subcoxae excepting sometimes on metapleura; sometimes additional spot present at anterior margin of mesopleura; evaporative areas darkly punctate. Legs concolorous with venter, with large fuscous spots often coalescing. Spiracles black. Abdominal sternites each with black line along lateral margins at basal angles. Median black spot near base of each of last three or four abdominal sternites increasingly larger and more longitudinally elongate toward apex of abdomen.

Posterior margin of pygophore deeply and broadly concave in caudal view, interrupted on each side of meson by large denticle, approximately paralleled by dorsal margin of inferior ridge (Fig. 304); less deeply concave in ventral view, denticles prominently displayed, notched at posterolateral corners (Fig. 305); trisinuately truncate in dorsal view (Fig. 306). Large median tubercle on proctiger preapical; distal portion of proctiger from base of tubercle and tubercle heavily pigmented (Fig. 310). Parameres shallowly cupped, with reticulated patch on lateral surface at apex (Fig. 311). Conjunctiva extensively pigmented apically, ventral appendage almost entirely so (Fig. 308). Broad median lobe of theca nearly hyaline (Fig. 309). Penisfilum obscured except in caudal view by surrounding median penal lobes.

HOLOTYPE: Male, labeled, Collection Schild-Burgdorf, Costa Rica, Turcurrique. Type No. 72126, U. S. National Museum.

PARATYPES: 2 ♂♂, 3 ♀♀. BRITISH HONDURAS: (a) Rio Grande, VIII-1931, J. J. White (b) J. C. Lutz Collection, 1961 (♂ BMNH); same data (♂ LHR). COSTA RICA: (a) Estrella Valley, April 1924 (b) H. W. Atkinson (♀ TAMU); (a) Tucurriquel (sic) (b) Schild-Burgdorf (♀ USNM). NICARAGUA: Collection Schild-Burgdorf, Costa Rica, San Carlos (♀ USNM) [San Carlos is in Nicaragua, at the southern end of Lake Nicaragua, near the Costa Rican border].

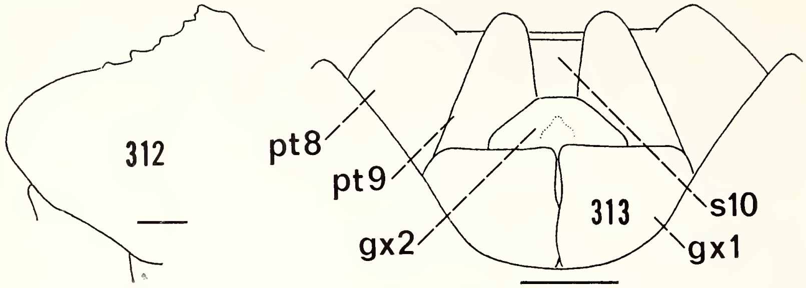
DISTRIBUTION: Costa Rica, Nicaragua, British Honduras.

COMMENT: The median depression and reflexed margins at the very apex of the scutellum is unique among *Euschistus* from Middle America, although present in several South American species of the genus. The cornute humeri of most specimens, with their polished, yellowish apex, and the median row of black spots on the abdominal venter aid in the recognition of this species.

Euschistus zagus, new species

Dorsum gray, with moderately dense and somewhat irregularly disposed castaneous to black punctures. Pale sordid yellow beneath with concolorous or rufous punctures. Length without membranes 9 mm.

Length and breadth of head equal, 2.1 mm. Lateral margins of



FIGS. 312–313. *E. zagus.* Fig. 312. Pronotum. Fig. 313. Female genital plates; first gonocoxa (gx1), second gonocoxa (gx2), eighth paratergite (pt8), ninth paratergite (pt9), tenth sternite (s10). Dimensional lines equal 0.5 mm.

juga subparallel for middle third of distance from eyes to broadly rounded apex. Tylus and juga subequal in length. Disk gently elevated at vertex, slightly impressed anteromesad of eyes, otherwise nearly flat. Fuscous to black dots sprinkled on antenniferous tubercles and basal three segments of antennae, apical two segments immaculate; basal segment sordid yellow, remaining segments rufous, basal segment not quite reaching apex of head, length of segments 0.5; 0.7; 1.0; 1.2; 1.3 mm. Bucculae evanescent at base of head, subequal in length to basal segment of rostrum.

Pronotum 1.8 mm. long at meson, 5.1 mm. wide across humeri. Anterior half of anterolateral margins coarsely denticulate (Fig. 312); denticles concolorous with disk, some with one or two black punctures. Broadly rounded humeri connected by finely punctate, subcalloused fascia. Pronotal disk moderately impressed posterolaterad of cicatrices before fascia.

Scutellar width and length subequal, 3.6 mm. wide by 3.5 mm. long; fovea in each basal angle consisting of a few contiguous punctures; apex moderately rounded, lightly punctate, little paler than disk. Vitreous membrane of hemelytra becoming brown at inner angle, with numerous small dark spots; veins few, simple. Narrowly exposed connexiva concolorous with hemelytra between black bands on each side of sutures.

Pleural surfaces of thorax with fixe black spots. Fuscous mottling covers evaporative areas. Castaneous to fuscous spots on legs mostly of moderate size on femora, small on tibiae. Spiracles black, also generous spot at basal angles, small spot on apical angles, and small longitudinally elongate median macula on sixth sternite.

Right first gonocoxa overlapping left at base; posterior margins of both forming nearly straight, transverse line; median and posterior margins of each subequal (Fig. 313). Second gonacoxae subtriangular, truncate apically between ninth paratergites; tenth sternite trapezoidal, a little narrower at base than at apex. Apices of ninth paratergites slightly exceeded by eighth paratergites.

HOLOTYPE: Female, labeled, (a) Type (b) Chilpancingo, Guerrero, 4600 ft. July. H. H. Smith (c) B.C.A. Hem. I, *Euschistus zopilotenses* (d) Brit. Mus. Type No. Hem. 1037. This specimen is one of the syntypes of *Euschistus zopilotensis* Distant.

PARATYPES: None.

DISTRIBUTION: Guerrero, Mexico.

COMMENT: The fuscous mottling of the evpaporative areas and macula on the sixth abdominal sternite may be artifacts, although the surfaces appear clean and no obvious discoloration is present elsewhere on the specimen. It is probable that the rufous flecking on the ventral surfaces will prove to be inconstant.

This species bears a superficial resemblance to *E. obscurus* in shape and size, and especially because of the pronotal fascia connecting the humeri. It differs conspicuously in the lighter color and absence of dark spots on the dorsum, in having black spiracles and spotted membranes, and in the construction of the genital plates.

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   1954. A revision of the species included in the genus *Novelsis* (Coleoptera: Dermestidae). *Trans. Amer. Entomol. Soc.*, 80: 73–90.
   Allee, W. D., A. E. Emerson, O. Park, T. Park, and K. P. Schmidt
   1949. Principles of animal ecology. Philadelphia and London, W. B. Saunders Co., 837 pp.
   Kistner, D. H.
   1969. The biology of termitophiles. *In* Biology of termites, vol. 1 (ed. K. Krishna and F. M. Weesner). New York and London, Academic Press, Inc., chap. 17, pp. 525–557.

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   4. Transverse fascia on corium always present and straight 5
   Transverse fascia on corium irregular, not straight; or fascia absent 8
   5. Dorsum piceous; all marginal areas of pronotum continuously and widely yellowish orange . . . . *ashmeadi* Heidemann
   Dorsum reddish brown; at most only the posterior marginal area of the pronotum yellowish 6

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   Attagenus megatoma: Dahl, 1823, p. 30.—Laporte, 1840, p. 35.—Erichson, 1846, p. 441.—Wollaston, 1854, p. 204.—LeConte, 1854, p. 109.—Chevrolat, 1863, p. 616.—Howe, 1952, p. 40.—Mroczkowski, 1954, p. 7; 1958, p. 4; 1962, p. 6; 1965, p. 668.—Zhantiev, 1963b, p. 421.

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7.

ENTOMOLOGICA AMERICANA

RECORDS AND DESCRIPTIONS OF CUBAN PSOCOPTERA

EDWARD L. MOCKFORD

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RECORDS AND DESCRIPTIONS OF CUBAN PSOCOPTERA

Edward L. Mockford[1]

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Abstract: The number of species of Psocoptera recorded from Cuba is raised from ten to 65. Of these, 26 are described as new. Types of species previously described from Cuba were reexamined and redescribed where necessary. Two new genera are erected, *Pseudarchipsocus* (Archipsocidae, type *P. guajiro* new species), and *Indiopsocus* (Psocidae, type *I. texanus* [Banks]). Three major biogeographic categories are present in the Cuban psocid fauna: endemics, Caribbean species, and waifs. In the present state of knowledge, endemics include the largest number of species and waifs the fewest.

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INTRODUCTION

Although several papers in recent years have dealt with Psocoptera from Florida (Mockford, 1953, 1955, 1957a, 1961, 1962, 1963, 1965b, 1966, 1969a, 1971, 1972, Sommerman, 1956), Texas (Mockford and Gurney, 1956, Sommerman, 1957), Mexico, and Central America (Mockford, 1957b, 1959, 1965a, b, c, 1966, 1967, 1969a, b, 1971, Mockford and Wong, 1969) very little has yet been written about Psocoptera of the Caribbean Islands.

A few descriptions of Antillean species are found in the works on 'Neuropteroids' of Hagen (1861, 1865) and Banks (1908, 1924, 1930, 1938, 1941). Enderlein's (1919) work on psocids in the collections of Selys Longchamps contains a description of one Antillean species. More recently, in dealing with particular taxa of psocids, I have described a few Antillean species (Mockford, 1955, 1966, 1967, 1969a, 1971).

To date, there are literature records of only ten species of Psocoptera from Cuba. Accordingly, it was with great interest that I received for study two collections of Cuban psocids. The first of these was made by Dr. Milton Sanderson, who collected in Cuba in 1959. Dr. Sanderson was accompanied and guided by Ing. Fernando de Zayas of Havana. From 1963 to 1967, Ing. de Zayas made several collecting trips. His material was sent to Dr. Sanderson, who received it late in 1969, and sent the psocids to me at that time. Material of two species from a light trap at the U. S. Naval Base, Guantanamo Bay, was received from the Florida Department of Agriculture.

The material of these collections contains 61 species. Four species already described from Cuba are not in the material, so that the Cuban psocid fauna is raised to 65 species. Of these, 28 species are new to science, or probably so, and 26 are here named and described. The Banks and Hagen types of Cuban psocids were examined, and redescriptions of these species are included. Types of the species described as new are for the present retained in my collection.

A diagnosis is included for each species determined with certainty. Redescriptions are not given for species that have already been described adequately, but literature citations of descriptions which I regard as adequate are given in these cases. For species originally described from the Old World and first recorded here from the New World, I have included notes comparing the Cuban material with descriptions of Old World material. I also include notes on extra-Cuban distributions of the species in this paper where such information is available.

Synonymies, where brief, are listed in full. In the case of lengthy synonymies, I have cited the original name and a recent reference to the complete synonymy. Smithers' catalog (1967) is the reference cited for complete synonymies except in cases where it is no longer up to date.

Measurements, except where they seem critical for identification, were restricted to a representative individual of each sex. Where individuals of new species were on hand from geographic areas outside of Cuba, a single individual of each sex from each such area was measured. Measurements of appendages and appendage parts are for one side of the body only. Measurements recorded as whole numbers are in microns, while those recorded as decimals are in millimeters. The following abbreviations were used for parts measured.

S, P = length of scape and pedicel respectively
f_1, f_2, etc. = length of first flagellomere, etc.
IO = smallest width of head between compound eyes
H = greatest width of head
D = greatest anteroposterior compound eye diameter in dorsal view of head
d = greatest lateral compound eye diameter in dorsal view of head
PO = d/D
FW = length of forewing
FWw = greatest width of forewing
F = length of posterior femur
f = greatest width of posterior femur
T = length of posterior tibia
t_1, t_2, etc. = length of first posterior tarsomere, etc.
t_1ct = number of ctenidia on first posterior tarsomere
S_1 = length of humeral seta, longest lateral seta on pronotum
Sa = length of longest dorsolateral seta of ninth abdominal tergum
Se = length of longest seta on epiproct

Records include all data presented with the specimens. Since Dr. Sanderson and Ing. de Zayas have done nearly all of the collecting, their names are abbreviated (M.W.S. and F.Z.) in the records.

The classification followed at the familial level and above is essentially that of Badonnel (1951).

SYSTEMATIC SECTION

FAMILY LEPIDOPSOCIDAE ENDERLEIN

SUBFAMILY PERIENTOMINAE ENDERLEIN

Proentomum personatum Badonnel.

P. personatum Badonnel, 1949a, p. 23.

DIAGNOSIS: Differing from other members of its subfamily by possession in forewing of segment of Sc rejoining R_1 before base of pterostigma, and by possessing frontal 'moustache' marks (Badonnel, 1949a, fig. 2).

This species was adequately described by Badonnel (1949a). The same author (1969) described several differences between the Ivory Coast type specimens and a specimen from Angola. Principal among these were width of the moustache marks and whether M_1 and M_2 of the hindwing arise from a common stem or separately. He concluded that the differences fall within the limits of a species. It is notable that all adult specimens on hand from the American Tropics (63 specimens) agree with the Angolan specimen in having wide moustache marks. All but one agree with this specimen in having M_1 and M_2 of the hindwing arising separately. The exception has these veins united basally in one wing and separate in the other.

Measurements of Cuban specimens are tabulated below.

f_1	f_2	FW	T	t_1	t_2	t_3
128	107	2.24	1049	419	75	83
115	110	2.18	1036	404	83	76

Cuban specimens are slightly smaller in flagellar measurements and slightly larger in leg measurements than the single measured type specimen. The only serious discrepancy is in posterior t_3, for which I suspect that Badonnel's figure may be in error as it is approximately equal to my figures for $t_2 + t_3$.

In addition to the Cuban records, I have Western Hemisphere records from southern Mexico, British Honduras, Guatemala, Panama, French Guiana, Brazil, Jamaica, Puerto Rico, and St. Thomas, Virgin Islands. All known adults are females, suggesting parthenogenesis.

RECORDS: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 1 ♀, M.W.S. Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

SUBFAMILY THYLACELLINAE ROESLER

Thylacella cubana (Banks), new combination

Echmepteryx cubana Banks, 1941, p. 393.

DIAGNOSIS: The only known New World species of its genus. Differing from described females of Madagascan species by possession of well sclerotized second valvula of gonapophyses. Differing from *T. immaculata* Badonnel (Angola) by possessing transverse color bands on forewing and by having second valvula much shorter. Differing from *T. fasciata* Badonnel (Angola) in having basal transverse band of forewing complete across wing.

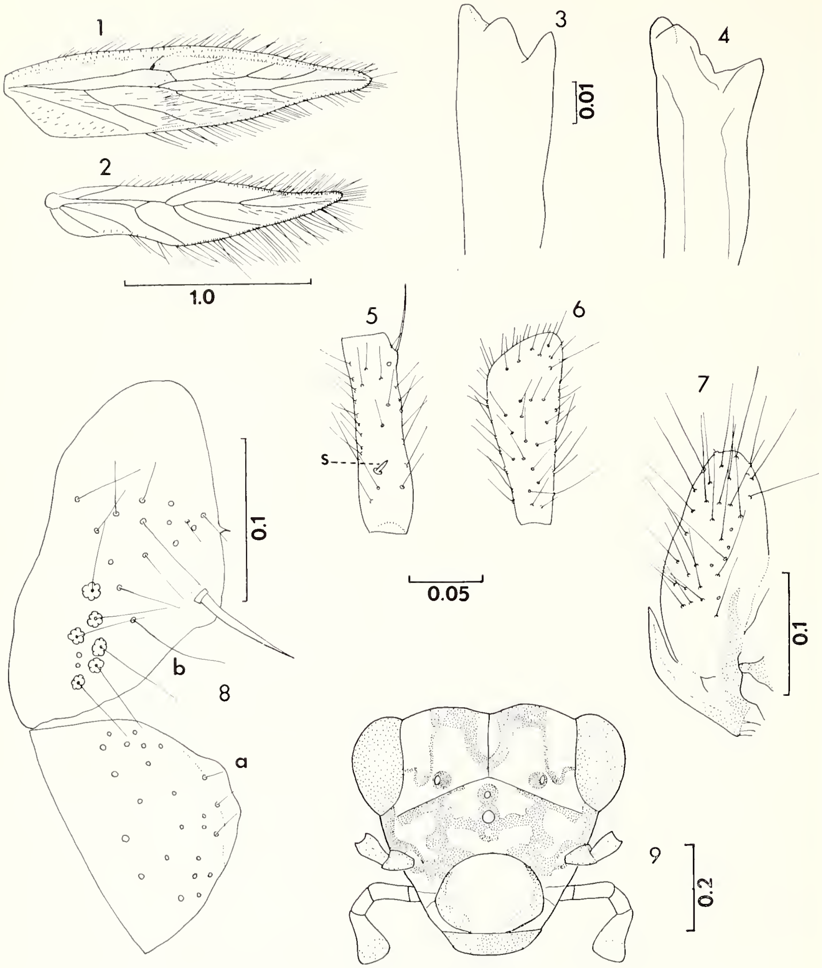
REDESCRIPTION: Female. Measurements (of paratype).

FW	T	t_1	t_2	t_3
1.87	0.82	0.33	70	62

MORPHOLOGY: Median ocellus somewhat smaller than laterals. Lacinial tip (figs. 3, 4) distinctly tridentate in Cuban material, quadridentate with very small middle denticle in mainland material. Maxillary palpus: sensillum of second segment (fig. 5) slender and acuminate; terminal segment (fig. 6) long, hatchet-shaped. Pretarsal claws typical of most species of genus—with two minute denticles, one near middle and one near apex; pulvillus relatively broad for this genus; a slender, straight seta at base of claw. Forewing (fig. 1) in general typical of the genus; first Rs segment absent in paratype, present in other specimens; distal Sc segment curved distally; IA faintly visible or not. In hindwing (fig. 2) R_{4+5} reaching wing margin posterior to apex; M_1 and M_2 arising separately from Rs. Gonapophyses (fig. 7) sclerotized at base. Sheath of spermathecal duct of about same length as third valvula of gonapophyses. Epiproct and paraproct as in figures 8a, b.

COLOR (in alcohol): Body generally dull yellow. Compound eyes black; ocellar pigment spots dark brown. A pale brown spot bordering each eye and another extending from median ocellus forward to frontoclypeal suture. Reddish brown band of each side of head continuing on each thoracic pleuron above leg bases to base of abdomen. Legs and antennae pale brown. Transverse bands of forewing each running from wing margin to wing margin as follows: first from base of pterostigma through distal end of areola postica; second from middle of cell R_1 through distal end of cell M_3; third from distal end of cell R_3 through cell M_1 distad of junction of vein M_2 with wing margin. Hindwings unmarked. Clunium and abdominal tip including sclerotized portions of gonapophyses dark reddish brown.

TYPE MATERIAL: Las Villas Prov.: Soledad, 9-15-VI-1939, C. T. Parsons collector. Holotype ♀ and 2 ♀ paratypes, number 25286 in Museum of Comparative Zoology, Cambridge, Massachusetts.



FIGS. 1–9. Structures of Cuban Lepidopsocidae. Figs. 1–8. *Thylacella cubana* (Banks) ♀. Fig. 1. Paratype, forewing. Fig. 2. Paratype, hindwing. Fig. 3. Paratype, lacinial tip. Fig. 4. Mexican specimen, lacinial tip. Fig. 5. Paratype, second segment of maxillary palpus (S = sensillum). Fig. 6. Paratype, distal segment of maxillary palpus. Fig. 7. Specimen from Texas, gonapophyses. Fig. 8. Paratype, a. epiproct, b. paraproct. Fig. 9. *Echmepteryx hageni* complex sp. ♀, front view of head. Scales in mm.

DISCUSSION: Outside of Cuba the species occurs on the Florida Peninsula from the Gainesville region southward and on the western side of the Gulf of Mexico from Brownsville, Texas south through eastern Mexico to Guatemala. Of the 132 adult specimens examined, all are females; this strongly suggests parthenogenesis. Since it is the only known New World species of its genus, it may have been introduced from Africa.

SUBFAMILY LEPIDOPSOCINAE ENDERLEIN

Echmepteryx (Echmepteryx) hageni complex species

DIAGNOSIS: Easily distinguishable from other Cuban Lepidopsocids by its facial pattern (fig. 9). Distinguishable from other members of its complex by details of this pattern.

I expect to treat this species in a later work dealing with the entire complex, which occurs throughout the Antilles and eastern North America.

RECORDS: Las Villas Prov.: Topes de Collantes, Sierra de Trinidad, June 11, 1959, 1 ♀, M.W.S. Oriente Prov.: Gran Piedra nr. Santiago, May 30–31, 1959, 2 ♀, M.W.S.; Loma del Gato, Sierra Maestra, May 26–28, 1959, 2 ♀, M.W.S. Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♂, 4 ♀, M.W.S.

Echmepteryx (Thylacopsis) falco (Badonnel)

Thylacopsis falco Badonnel, 1949a, p. 24.
Echmepteryx falco (Badonnel): Smithers, 1967, p. 7.

DIAGNOSIS: Distinguishable from other members of its subgenus by its facial marking (Badonnel, 1949a, fig. 9).

This species was adequately described by Badonnel (1949a). It has been recorded in the literature only from the Ivory Coast and Madagascar. In addition to the Cuban record, the species is known in the Western Hemisphere from southern Mexico, Panama, French Guiana, Surinam, Guyana, Brazil, Trinidad (West Indies), Antigua (West Indies), and Puerto Rico. The 175 adult specimens on hand and the previously published records (8 specimens) are all females; thus parthenogenesis is strongly suggested.

Measurements of the Cuban specimen are as follows:

f_1	f_2	f_3	FW	FWw	T	t_1	t_2	t_3
38[1]	38[1]	40[1]	2.04	496	960	338	68	65

In general, the measurements agree closely with those given by

---

[1] abnormally shortened antenna.

Badonnel for one of the types from the Ivory Coast. The first and second tarsal segments are somewhat longer.

RECORD: Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

KEY TO THE SUBFAMILIES, GENERA, AND SUBGENERA OF CUBAN LEPIDOPSOCIDAE

1. Wings and body beset with numerous setae but without scales .... Subfamily Thylacellinae
   Cuban genus, *Thylacella*, single Cuban species *T. cubana* (Banks)
   Wings and body clothed with scales 2
2. Antennae with at most 24 segments, each flagellar segment about four times as long as wide. In hindwing a closed basal cell present .... Subfamily Perientominae (single Cuban genus *Proentomum*, single Cuban species *P. personatum* Badonnel)
   Antennae with 30 to 50 segments, each flagellar segment not more than twice as long as wide. In hindwing no closed basal cell .... Subfamily Lepidopsocinae (single Cuban genus *Echmepteryx*) 3
3. Radial fork stem in forewing longer than R_{4+5} .... *Echmepteryx* (*Thylacopsis*) (single Cuban species *E.* (*T.*) *falco* Badonnel)
   Radial fork stem in forewing equal to or shorter than R_{4+5} .... *Echmepteryx* (*Echmepteryx*) (single Cuban species *E.* (*E.*) *hageni* complex species)

FAMILY PSYLLIPSOCIDAE ENDERLEIN

Psocatropos microps (Enderlein)

Axinopsocus microps Enderlein, 1903, p. 3. Complete synonymy in Smithers, 1967, p. 15.

DIAGNOSIS: Differing from *P. lachlani* Ribaga (Italy) by having distal segment of maxillary palpus long and slender. Differing from *P. pilipennis* (Enderlein) (India, Seychelles, Madagascar) by having M in forewing three-branched and having hypandrium much wider than long. Differences from other named species not known.

This species has been described adequately by Badonnel (1931, 1967). It is circumtropical and occurs frequently in houses on the walls. Both of the Cuban records are from this situation.

RECORDS: Habana Prov.: Vedado, Oct., 1965, 1 ♂, F. Z.; same locality, July 1966, 1 ♂, 1 ♀, 2 nymphs, F. Z.

FAMILY LIPOSCELIDAE ENDERLEIN

Liposcelis entomophilus (Enderlein)

Troctes entomophilus Enderlein, 1907, p. 34. Complete synonymy in Smithers, 1967, p. 25.

DIAGNOSIS: A species of Section I, Group A, Subgroup Ab of Badonnel (1962, 1963). Differing from other members of its subgroup by its particular dorsal abdominal color pattern (see key).

This species has been described adequately by Broadhead (1947b, 1950). It is cosmopolitan in distribution. It is frequently carried in human commerce and has been taken on the plumage of a live bird (Mockford, 1967).

RECORD: Habana Prov.: Vedado, July, 1966, 2 ♀, F. Z.

Liposcelis bostrychophilus Badonnel

L. bostrychophilus Badonnel, 1931, p. 250. Complete synonymy in Smithers, 1967, p. 24.

DIAGNOSIS: A species of Section II, Group D of Badonnel (1962, 1963), differing from *L. flavidus* Badonnel and *L. prenolepidis* Enderlein by its darker coloration; differing from *L. paetus* Pearman and *L. rugosus* Badonnel by possessing seven ocelloids in compound eye; differing from *L. subfuscus* Broadhead by its much shorter pronotal humeral setae.

This species has been described adequately by Broadhead (1947a, 1950) and Broadhead and Hobby (1944). It is cosmopolitan in distribution and is parthenogenetic, males being unknown. It is frequently encountered in domestic situations and is often carried in human commerce.

RECORD: Habana Prov.: Vedado, no date, in insect collection, 2 ♀, F. Z.

Liposcelis species

A single male represents a species other than the above two but cannot be identified.

RECORD: Habana Prov.: Vedado, no date, in insect collection, F. Z.

Embidopsocus laticeps Mockford

E. laticeps Mockford, 1963, p. 33.

DIAGNOSIS: A member of Group I, Subgroup b of Badonnel (1955). Very similar to *E. machodoi* Badonnel and *E. pauliani* Badonnel (West Africa) but differing from both in details of shape of spermapore sclerite. Differing from *E. luteus* (Hagen) as described under that species.

The species was described adequately by Mockford (1963). It is known from scattered localities throughout the state of Florida and from a single locality in southern Illinois.

The single lot of Cuban material consists entirely of macropterous females. Measurements for ten of these, representing all specimens in suitable condition for measurement, are summarized below.

	FW	H	f_1	f_2	f_3	F	f	T
Number	10	10	9	9	9	10	10	10
Minimum	1365	400	107	106	100	468	151	333
Maximum	1579	455	135	137	127	526	180	369
Mean	1448	431	119	118	116	497	165	346
Std. deviation	43.4	17.3	9.9	11.3	9.8	18.3	8.8	12.4

	t_1	t_2	t_3	S_1	S_a	S_e
Number	10	10	10	7	9	7
Minimum	77	39	51	50	138	68
Maximum	94	51	66	64	170	89
Mean	84	43	62	55	164	83
Std. deviation	5.2	3.5	4.8	4.6	12.4	8.4

Floridian specimens fall within or overlap the ranges of measurements shown by Cuban material except in F and t_1. In both of these, Florida material is smaller. Although this species is very similar to the next one, several differences were noted (see under *E. luteus* Hagen) which appear to be constant.

RECORD: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23, 1959, under bark of fence, M.W.S., 12 ♀ macropterous.

Embidopsocus luteus Hagen

E. luteus Hagen, 1865, p. 6.
E. reticulatus Badonnel, 1972, p. 1106.

DIAGNOSIS: A species of Group I, Subgroup b of Badonnel (1955). Very similar to *E. laticeps* Mockford, differing as indicated in redescription.

REDESCRIPTION (based on one of two cotypes, both macropterous females; the specimen used for the redescription was designated lectotype): Measurements:

FW	H	f_1	f_2	f_3	F	f
1.52	0.42	0.131	0.134	—	0.52	0.171

T	t_1	t_2	t_3	S_1	S_a	S_e
0.36	0.081	0.045	0.046	0.048	0.142	—

MORPHOLOGY: Head and thoracic terga of usual form for macropterous individuals of the genus. Pretarsal claw (fig. 14) with six denticles along its ventral surface, the preapical two largest. Forewing (fig. 10) with two principal longitudinal veins fading in about distal third of wing, disappearing in about distal sixth. Anterior longitudinal vein sending stout branch to wing margin at about half its length. Hindwing (fig. 11) with only slight indications of veins. Transverse sclerotized strips of abdominal terga 4 to 6 only very slightly flexuous (fig. 12).

Color: Not noted except forewing membrane apparently uniformly clear.

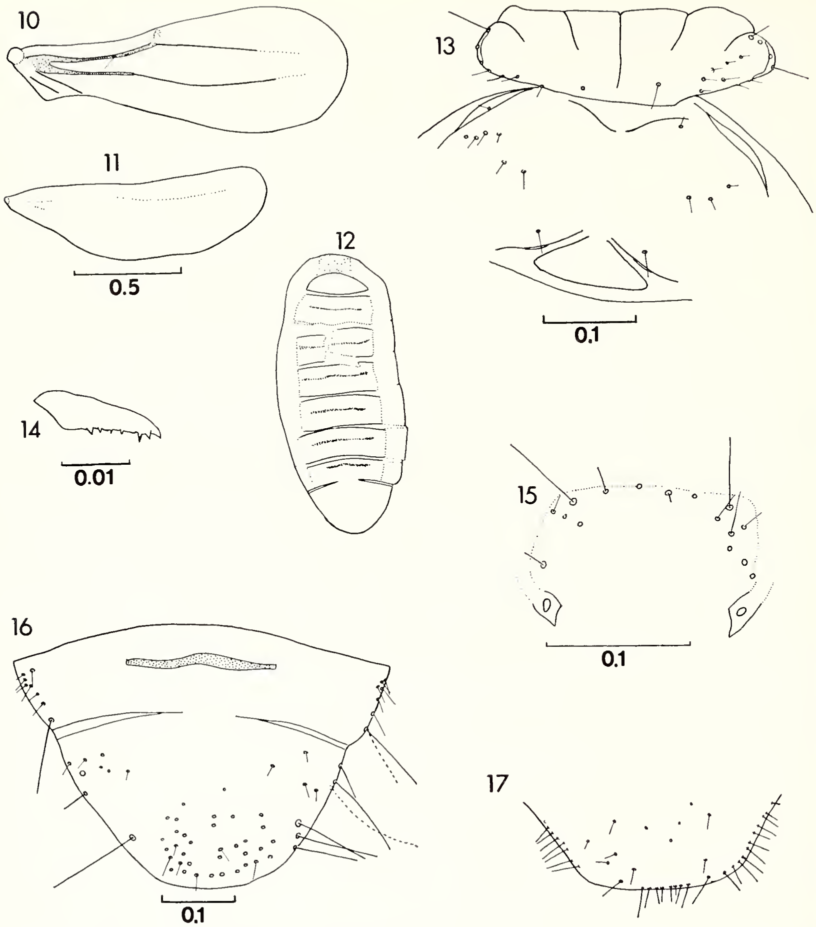
Chaetotaxy: Lateral lobes of pronotum (fig. 13) each with long humeral seta, one or two setae as long as or longer than humeral seta in front of it; several short setae scattered over surface. Prosternum (fig. 15) with long seta near each anterolateral corner, several shorter setae scattered along its anterior and lateral edges. Chaetotaxy of terminal abdominal terga as in figure 16, of subgenital plate as in figure 17.

Sculpture Of Integument: Head as described for *E. laticeps* (Mockford, 1963:35). Sculpture not observed on abdominal terga.

Type Material: Cuba (Gundlach), no date. Lectotype macropterous ♀ on slide, paralectotype macropterous ♀ glued on paper, in Museum of Comparative Zoology, Cambridge, Massachusetts. Both bear type number 186.

Discussion: The lectotype differs from the series of *E. laticeps* examined as follows: 1) The compound eye diameter is approximately 125μ versus 106 to 114μ in *E. laticeps*; 2) the anterior vein of the forewing (fig. 10) has a distinct connection to the wing margin versus no connection or only an indistinct one in *E. laticeps*; 3) the middle pretarsal claw (fig. 14) has five distinct denticles before the preapical one, one of these large and set close to the preapical one, versus three denticles before the preapical one, none very close to it in *E. laticeps*; 4) the posterior tarsus has t_2 approximately 45μ versus 39μ to 42μ in *E. laticeps*, and t_3 is approximately 46μ versus 51μ to 64μ in *E. laticeps*; 5) the posterior margin of the subgenital plate has a row of eight setae flanked on each side by a space, the lateral two members of the row only slightly longer than the others, versus a row of six setae, the lateral two being much longer than the others in *E. laticeps*; 6) the transverse sclerotized strips of abdominal terga 4 to 6 are only slightly flexuous, versus decidedly flexuous in *E. laticeps* (Mockford, 1963, fig. 51).

Badonnel (1972) has noted the synonymy of his Brazilian species *E. reticulatus* with this one. Without reexamination of the lectotype, I am unable to confirm or refute his view but tentatively accept it.



FIGS. 10–17. Structures of *Embidopsocus luteus* Hagen, ♀ lectotype. Fig. 10. Forewing. Fig. 11. Hindwing. Fig. 12. Abdominal terga, scale of wings. Fig. 13. Prothoracic and mesothoracic terga. Fig. 14. Mesopretarsal claw. Fig. 15. Prothoracic sternum. Fig. 16. Abdominal terga VIII–X, dorsal surface. Fig. 17. Subgenital plate, scale of Fig. 13.

KEY TO THE SUBFAMILIES, GENERA AND SPECIES OF CUBAN LIPOSCELIDAE

1. Hind tibia with stout terminal spur. Winged forms with ocelli and many-faceted compound eyes. Wingless forms without ocelli and

with compound eyes of two facets. Hind femur lacking an external hump .... Subfamily Embidopsocinae (single Cuban genus *Embidopsocus*) 2

Hind tibia without terminal spurs. Only wingless forms, lacking ocelli and with compound eyes of not over eight facets. Hind femur with an outer hump .... Subfamily Liposcelinae (only one genus, *Liposcelis*) 3

2. Anterior vein of forewing with weak connection, if any, to anterior wing margin. Series of setae of posterior margin of subgenital plate with outer member of either side much longer than others .... *E. laticeps* Mockford

Anterior vein of forewing with strong connection to wing margin. Series of setae of posterior margin of subgenital plate with outer member of either side only slightly longer than others .... *E. luteus* (Hagen)

3. Abdominal terga 3 to 4 uniform in sclerotization and sculpture, not presenting posterior membranous band with sculpture different from anterior part 4

Abdomen with posterior parts of terga 3 to 7 membranous, membranous zones differing in sculpture from anterior sclerotized regions of these terga. Sclerotized regions of abdominal terga uniformly brown in color .... *L. bostrychophilus* Badonnel

4. Color uniformly pale gray except for purple pigment granules ventrally in head and neck .... *L.* species

Abdominal terga marked with broad bands of brown interrupted medially .... *L. entomophilus* (Enderlein)

FAMILY PACHYTROCTIDAE PEARMAN

Tapinella aliena (Banks), new combination

Psylloneura aliena Banks, 1941, p. 393.

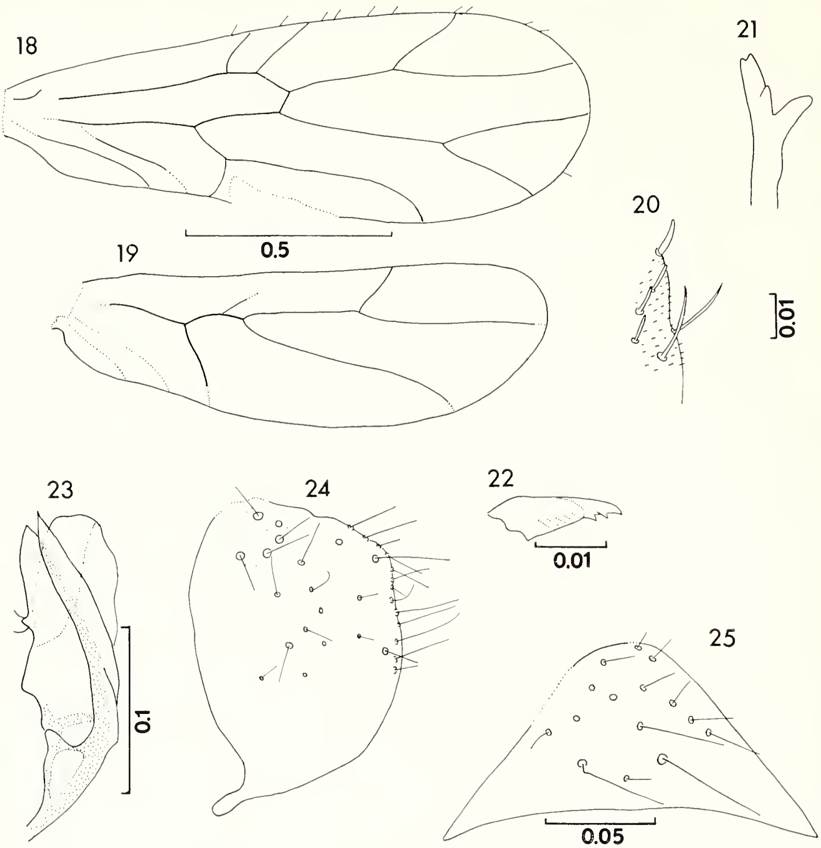
DIAGNOSIS: Differing from other described species of its genus by abdominal color pattern, described below, and by possession of two sizeable preapical denticles of pretarsal claw (fig. 22).

REDESCRIPTION (based on holotype and one paratype):

Macropterous female. Measurements (of paratype):

FW	T	t_1	t_2	t_3
1.35	0.54	0.29	0.062	0.056

MORPHOLOGY: Sensilla of terminal segment of maxillary palpus (fig. 20) four short rounded hairs arranged roughly in longitudinal row. Lacinial tip (fig. 21) with three prongs, the outer one bifid at tip. Pretarsal claw (fig. 22) with two large denticles in distal third, no denticles, but striations in basal two-thirds. Forewing (fig. 18) with basal portion of Sc present but not reaching wing margin; distal



FIGS. 18–25. Structures of *Tapinella aliena* (Banks), ♀ paratype. Fig. 18. Forewing. Fig. 19. Hindwing. Fig. 20. Sensilla of distal segment of maxillary palpus. Fig. 21. Lacinial tip, scale of Fig. 20. Fig. 22. Pretarsal claw. Fig. 23. Gonapophyses. Fig. 24. Paraproct, scale of Fig. 23. Fig. 25. Epiproct.

portion (basal closing vein of pterostigma) curved; R_{2+3} curved; vein Cu_{1a} parallel to wing margin most of its length. Hindwing with R_1 partially developed, arising from second segment of R + M. Gonapophyses (fig. 23) of usual form for the genus, second valvula acutely pointed apically. Paraproct (fig. 24) with sensory area of five setae arranged in a partial circle. Epiproct (fig. 25) bearing two long setae near its base and long one mesially; all other setae short, none stout.

COLOR: Compound eyes of dried specimen iridescent grayish green (holotype) or golden yellow (paratype). A red band from compound eye through antennal base to epistomal suture, continuing on clypeus as faint red lines or a red smudge. Head otherwise unmarked. Terminal segment of maxillary palpus dark brown posteriorly, paler anteriorly. Thorax marked laterally with reddish brown. Each preclunial abdominal segment marked with red band across tergum terminating laterally where reaching dark reddish brown longitudinal double stripe along each side. Wings uniformly tawny brown.

TYPE MATERIAL: Las Villas Prov.: Soledad, 24–30 May (C. T. Parsons). Holotype macropterous ♀ and one macropterous ♀ paratype. Both specimens bear number 25285 in the Museum of Comparative Zoology, Cambridge, Massachusetts.

DISCUSSION: The species is assigned to *Tapinella* as the hindwing (fig. 19) shows no trace of broadening in its middle.

Tapinella species

DIAGNOSIS: Similar in color pattern to *T. aliena*, but differing in lack of lateral longitudinal stripes of abdomen. Pretarsal claws with single sizeable preapical denticle preceded by series of minute denticles.

The single Cuban specimen is not adequate for a description of this species. Since most of the material on hand is Mexican and Guatemalan, I plan to describe it in a separate paper.

RECORD: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 1 ♀, M.W.S.

KEY TO THE CUBAN SPECIES OF TAPINELLA

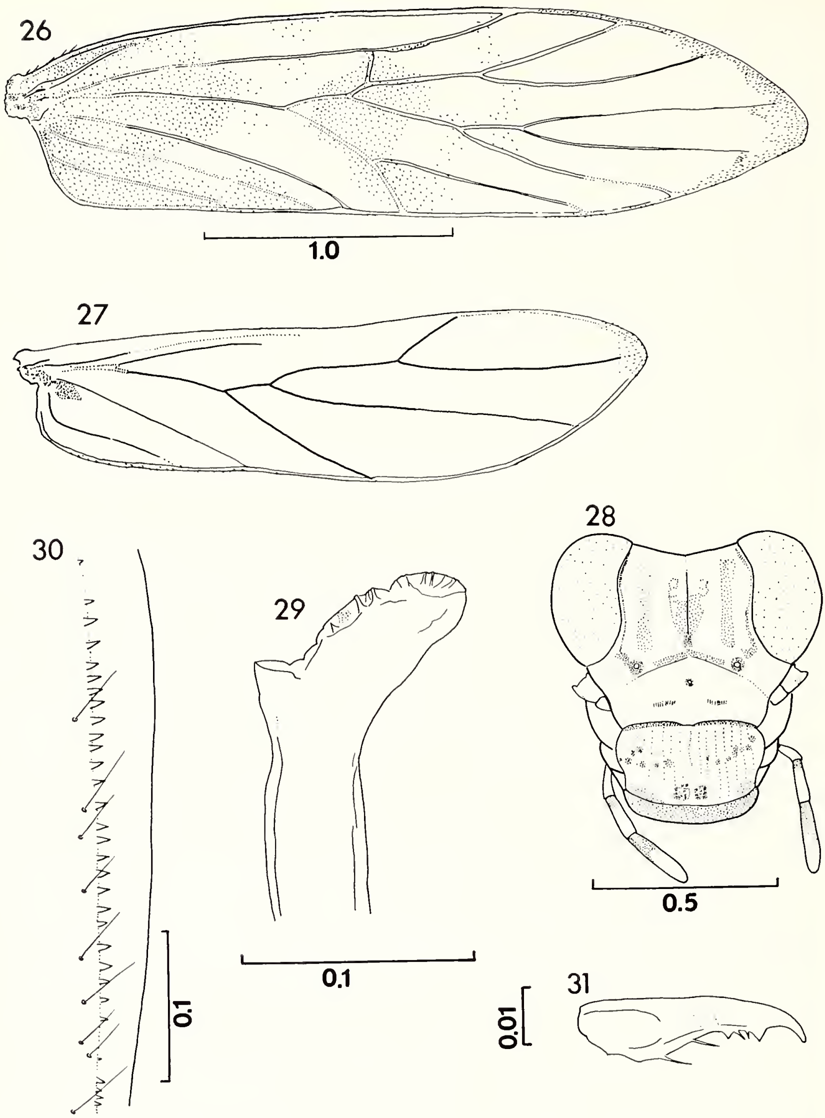
1. Pretarsal claw with two sizeable preapical denticles and no other denticles (fig. 22). Each side of abdomen marked with a longitudinal reddish brown double stripe .... *T. aliena* (Banks)
   Pretarsal claw with a single sizeable preapical denticle preceded by several minute denticles. Sides of abdomen without longitudinal reddish brown stripes .... *T.* species

FAMILY AMPHIENTOMIDAE ENDERLEIN

SUBFAMILY AMPHIENTOMINAE ENDERLEIN

Amphientomum hystrix, new species

DIAGNOSIS: Very similar to the Mexican fossil form *A. elongatum* Mockford, but differing primarily by more elongate, narrower distal third of forewing with proportionately narrower median cells.



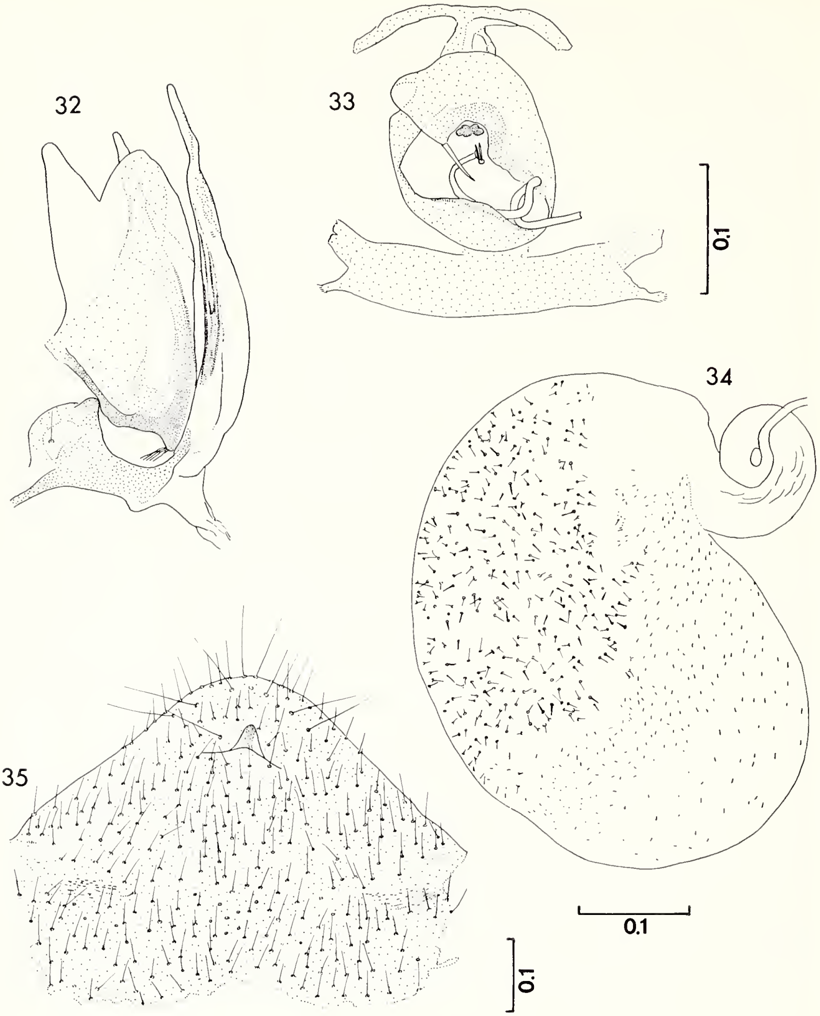
FIGS. 26–31. Structures of *Amphientomum hystrix*, new species ♀. Fig. 26. Forewing. Fig. 27. Hindwing. Fig. 28. Front view of head. Fig. 29. Lacinial tip. Fig. 30. Row of denticles of anterior femur. Fig. 31. Pretarsal claw.

Female. Measurements:

f_1	f_2	f_3	f_4	f_5	FW	T	t_1	t_2	t_3	t_1ct
312	308	314	246	180	3291	1213	917	120	128	40

MORPHOLOGY: Epicranial line pronounced, frontal lines vague except basally; vertex concave between compound eyes. Ocelli far apart, the laterals immediately above and touching each frontal line near each compound eye. Antennae 12 segmented, bearing sparse long setae in several irregular ranks. Lacinial tip (fig. 29)—lateral cusp bearing two ridges, an anterior and a posterior in normal orientation of lacinia; anterior ridge of low, irregular denticles; posterior ridge sharp, divided about halfway along its length; median cusp short. Forewing (fig. 26) elongate, slender, tapering toward apex, but apex rounded. Stem of Rs directed approximately anteroposteriorly; r-m crossvein nearly longitudinal. Rs fork stem about equal in length with R_{2+3}. Common stem of M_1 and M_2 relatively long; areola postica elongate and low. Cu_2 and IA not joining at wing margin; IA and IIA parallel for most of their lengths. Hindwing (fig. 27) shaped as forewing, lacking any trace of basal piece of Rs. Row of spines of first femur (fig. 30) extending from end of basal fourth of femur nearly to distal end, including 32 spines. Posterior tarsus with 39 ctenidia; first tarsomere with two strong spines at tip, second with one; pretarsal claw (fig. 31) bearing two setae in basal half, a few faint oblique striations in middle third, two distinct preapical denticles. Subgenital plate (fig. 35) with two long setae on middle of posterior margin, a submarginal arched row of 6 long setae; sclerite as in figure. Gonapophyses (fig. 32) of usual form for the genus. Spermapore sclerite (fig. 33) a complexly sclerotized ring bordered posteriorly (?) by narrow, somewhat curved sclerite connected to ring in its middle by short stem; bordered anteriorly (?) by slightly sclerotized band. Spermatheca (fig. 34) about half covered with minute spines and setae. Sense tubercle of paraproct with seven trichobothria.

COLOR (in alcohol): Compound eyes gray with faint transverse lines suggesting banding pattern in life. Ground color of head yellowish white; head marked (fig. 28) with spotty brown band bordering each compound eye and another bordering epicranial line. From anterior end of epicranial line a broad dark brown line running toward each compound eye and turning abruptly downward before reaching eye. Postclypeus with broad spotty brown band below its dorsal limit and three diffuse brown spots just above its ventral limit. Gena with diffuse brown spot behind antennal base. Antenna white basally, brown from third flagellomere outward. Thorax brown, palest around leg bases and notal sutures. Forelegs white except for following brown



FIGS. 32–35. Structures of *Amphientomum hystrix*, new species ♀. Fig. 32. Gonapophyses, scale of Fig. 33. Fig. 33. Sclerotizations around spermapore. Fig. 34. Spermatheca. Fig. 35. Subgenital plate.

marks: partial band on femur before distal end, basal and subapical band on tibia, basal band on first tarsomere, entire second and third tarsomeres. Middle and hindlegs same except coxae brown on both. Forewings (fig. 26) mostly clear with a few irregular brown blotches.

Hindwings unmarked. Abdomen with ground color white; a diffuse dark brown band along each side for its entire length, becoming most distinct in two preclunial segments; a narrow diffuse dark brown band along dorsal midline ending before clunium. Clunium and subgenital plate medium brown.

HOLOTYPE ♀ AND 2 ♀ PARATYPES: Matanzas Prov.: Mercedes, Dec., 1966, in Mamoncillo, F.Z.

Amphientomum species

A single specimen in very bad condition represents a distinct species. The vertex is slightly convex between the compound eyes. Bilaterally asymmetrical swellings on the middle and hind tibiae strongly suggest an anomalous condition, so that I decline to base a new species on this individual.

RECORD: Oriente Prov.: Yateras, June 1, 1959, 1 ♀ M.W.S.

FAMILY EPIPSOCIDAE PEARMAN

Epipsocus ornatus, new species

DIAGNOSIS: Very similar to *E. antillanus* Banks (Jamaica) and *E. icarus* Banks (Hispaniola), all having M of forewing dichotomously four-branched. Differing from *E. antillanus* in having brown spot at base of each seta on veins of forewing; differing from *E. icarus* in having band of distal margin of forewing completely lacking in cell M_3 and interrupted in cell M_1; areola postica in its distal half not so low.

Female. Measurements:

FW	T	t_1	t_2	t_1ct	t_2ct	IO	D	d	IO/D	PO
3612	1500	649	186	30	5	0.40	0.30	0.25	1.30	0.83

MORPHOLOGY: Epicranial line distinct, frontals absent. Dorsal margin of postclypeus faint, biconvex. A circular clear spot mesiad of each antennal base. Sclerotized transverse bars of labrum running completely across labrum and joined anteriorly by cross piece. Lacinial tip (fig. 38) broad and multidenticulate. Pretarsal claw as in figure 40. Subgenital plate (fig. 42) with free margin rounded, bearing three setae at apex; pigmentation weak except for two anterolateral dark spots (one each side) apparently marking thickening of cuticle. Gonapophyses (fig. 41): first valvula represented only by slight sclerotization in membrane mesiad of other valvulae; second and third valvulae fused together; second with elongate, slender, setulose tip; third valvula rounded laterally, bearing two long setae and seven shorter ones. Spermapore (fig. 41) surrounded by weakly sclerotized ring somewhat triangular in shape with apex posterior. Paraproct

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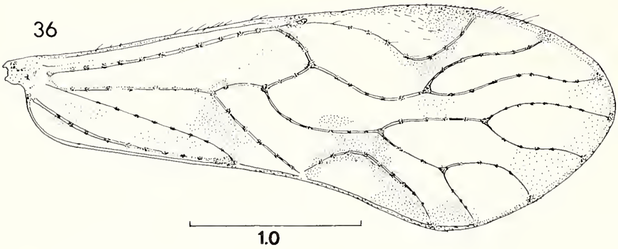

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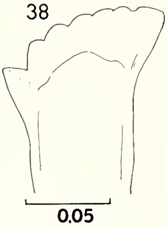

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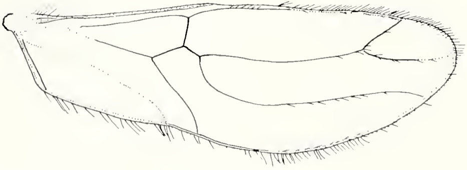

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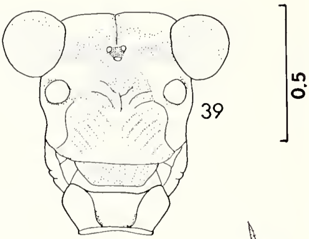

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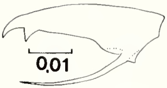

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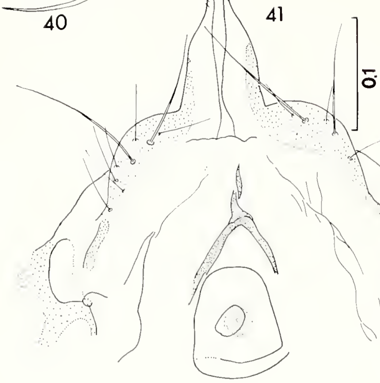

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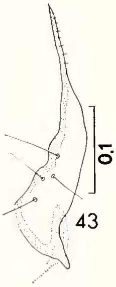

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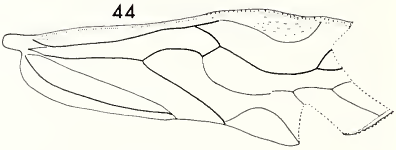

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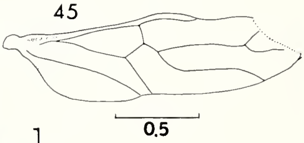

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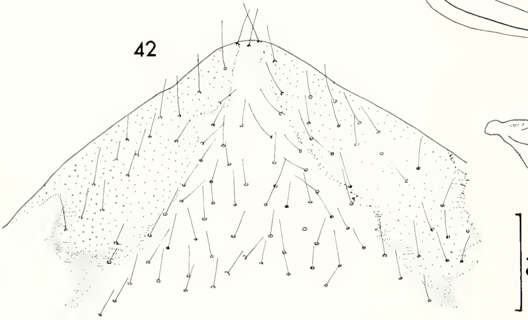


with numerous long setae, mostly marginal, some very attenuated, slender much of their length; sense cushion bearing 20 and 21 trichobothria, some with only partially formed basal florets. Epiproct with three long, attenuated basal setae and numerous setae near tip, some attenuated.

COLOR (in alcohol): Antennal base dark brown, remainder of antenna paler brown. Compound eyes gray; ocellar interval dark brown. Background color in general yellowish white. Head marked as follows (fig. 39): mottled brown band along epicranial line; brown band across head between compound eyes running through ocellar interval anteriorly, delimited anteriorly along a line but fading and becoming mottled posteriorly; triangular brown spot on frons with its vertex on ocellar interval and its base in postclypeus. Diffuse dark brown band from compound eye through antennal base to brown frontal spot, crossing this spot under cuticle to become continuous with band of other side. Postclypeus striated with medium brown. Anteclypeus and labrum between its vertical bars medium brown. Thoracic pleura of each side with diffuse dark brown band running their length immediately above coxae, otherwise medium brown. Anterior mesonotal lobe mostly medium brown. Legs each with brown preapical band on femur, another on base of first tarsomere; second tarsomere dusky brown. Forewing (fig. 36) with pronounced brown spot at base of each seta, brown spot in distal end of pterostigma, another below posterior angle of pterostigma, another in areola postica and extending out anterior to it; brown band of distal wing margin from spot in areola postica extending around margin, with interruptions as noted in diagnosis, to vein R_{4+5}; brown spot in cell Cu_{1b} immediately beyond M-Cu separation; dark brown spot at nodulus. Hindwings (fig. 37) unmarked. Abdomen with broad brown band along each side continuing from thorax on segments 1 to 7, band continuous over tergum on first segment; segments 2 to 7 each with pair of brown spots dorsally; subgenital plate medium brown.

HOLOTYPE ♀: Oriente Prov.: Gran Piedra, June 1967, F.Z.

←

FIGS. 36–45. Structures of Cuban *Epipsocidae*. Figs. 36–42. *Epipsocus ornatus*, new species ♀. Fig. 36. Forewing. Fig. 37. Hindwing. Fig. 38. Lacinial tip. Fig. 39. Front view of head. Fig. 40. Anterior pretarsal claw. Fig. 41. Gonapophyses and ninth sternum. Fig. 42. Subgenital plate. Figs. 43–45. *Mesepipsocus mobilis* (Hagen), holotype ♀. Fig. 43. Gonapophyses. Fig. 44. Forewing. Fig. 45. Hindwing.

Mesepipsocus mobilis (Hagen), new combination

Psocus mobilis Hagen, 1861, p. 12.
Caecilius mobilis (Hagen): Hagen, 1866, p. 205.
Psocidus mobilis (Hagen): Smithers, 1967, p. 109.
Mesepipsocus grassei Badonnel, 1969, p. 79, **New Synonymy**.

DIAGNOSIS: Female gonapophyses (fig. 43) lacking first valvula (but holotype with bilaterally present fold in membrane at first valvular position). Differing from *Epipsocus s.l.* species with similar gonapophyses as follows: from *E. roncodarensis* New, *E. sinuatus* New, *E. taitubai* New, *E. obscurus* New, *E. brevistigma* New, *E. brasilianus* New, and *E. roesleri* New by lack of spots at ends of longitudinal veins of forewing; from *E. brunellus* New by macroptery.

The species was described adequately by Badonnel (1969) under the synonym *Mesepipsocus grassei*. I have made the following notes on the type.

Measurements:

FW	T	t_1	t_2
2.22	1.08	0.49	0.135

GENERAL FEATURES: Macropterous. Wings unmarked, with venation normal for *Epipsocus* (figs. 44, 45). Gonapophyses as in figure 43; second valvula with tip greatly attenuated, bearing a few minute spinelets; rudimentary third valvula represented by swelling on side of second valvula bearing four setae.

HOLOTYPE ♀: Cuba (von Winthem), no additional data, in Museum of Comparative Zoology, Cambridge, Massachusetts.

KEY TO THE CUBAN SPECIES OF EPIPSOCIDAE

1. Media of forewing dichotomously four-branched. Forewings with dark spots at bases of setae on veins and with several color marks in membrane .... *Epipsocus ornatus*, new species
Media of forewing three-branched. Forewing apparently unmarked .... *E. mobilis* (Hagen)

FAMILY AMPHIPSOCIDAE PEARMAN

Dasydemella dezayasi, new species

DIAGNOSIS: Similar to *D. setosa* Roesler, differing in that only hairs in basal half of wing arising from brown spots, and brown border of pterostigma lacking. Head virtually unmarked.

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
4374	1459	427	186	17	364	317	261	1.15	0.82

MORPHOLOGY: Lacinial tip (fig. 48) flat and broad with a few low denticles. Each tibia with a few small upright setae near its distal end scattered among larger setae set at angle. Pretarsal claw bearing wide pulvillus flaring at its tip; basally claw bearing long seta and two short ones. Free margin of hypandrium with setae scattered evenly along it. Posterior two abdominal vesicles present; anterior vesicle apparently absent. Phallosome (fig. 49) with broad parameres; anterior end of frame weakly sclerotized; posterior end acutely angular but blunt tipped. Hypandrium as in figure 50. Paraproct bearing prominent blade-like cone flanked by two long, stout setae (fig. 52) on free margin. Sense cushion of paraproct bearing 31 and 32 trichobothria on specimen examined.

COLOR (in alcohol): Body and appendages in general dull yellowish white. Compound eyes purple; ocellar interval dark brown. Head with faint pale brown band bordering each compound eye dorsally. Thoracic terga pale brown except around lateral margins and on midline. Abdomen with diffuse reddish brown band from base to clunium dorsolaterally on each side. Forewings (fig. 46) clear, brown spot at base of each seta in basal half of wing, and brown spot at base and at tip of pterostigma. Hindwings (fig. 47) unmarked.

HOLOTYPE ♂ AND 1 ♂ PARATYPE: Oriente Prov.: La Siberia, Sierra Maestra, June, 1967, F.Z.

Polypsocus fasciatus Banks

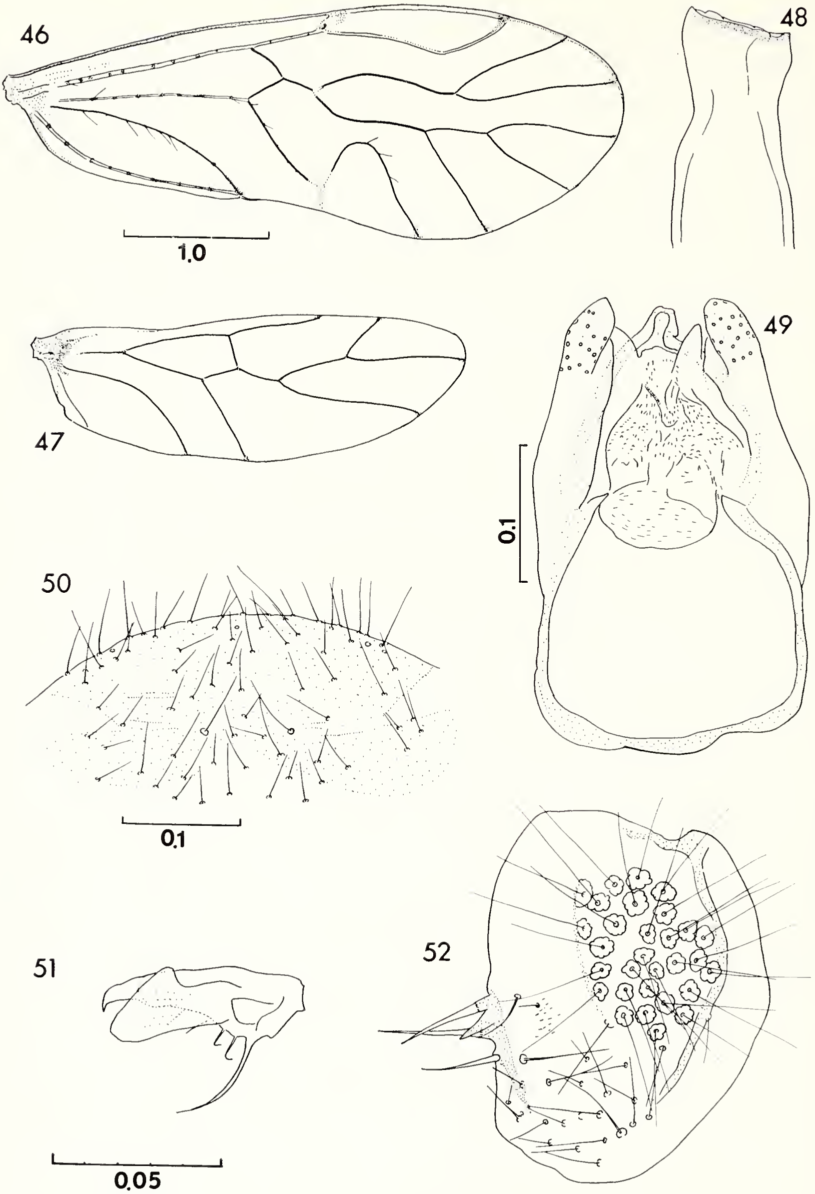
P. fasciatus Banks, 1908, p. 258.

DIAGNOSIS: The only species of its genus regularly showing accessory venation in cell R of forewing (figs. 53, 54).

REDESCRIPTION: Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
2600	949	345	121	19	236	300	239	0.79	0.80

MORPHOLOGY: Lacinial tip (fig. 57) with high median cusp scarcely separate from sloping lateral cusp. Epicranial line distinct to ocellar interval; frontal lines absent. Each pretarsal claw subtended by broad appendage flaring at tip; base of each claw ventrally with strong seta. In forewing an extra, incomplete transverse vein in cell R. Radial fork stem exceedingly short, branches of Rs about half length of forewing and flexuous. Areola postica about 2½ times as long as broad. Free margin of hypandrium (fig. 55) with rounded, protruding middle region flanked by several long setae on each side (five in the specimen on hand). Phallosome (fig. 56) rounded basally with slight corners on sides at base, with acute posterior end and



FIGS. 46–52. Structures of *Dasydemella dezayasi*, new species ♂. Fig. 46. Forewing. Fig. 47. Hindwing. Fig. 48. Lacinial tip, scale of Fig. 51. Fig. 49. Phallosome. Fig. 50. Hypandrium. Fig. 51. Pretarsal claw. Fig. 52. Paraproct, half scale of Fig. 51.

narrow parameres; endophallus with middle region divided and spinose; bearing two prominent lobes laterally. Sense cushion of paraproct with 22 to 24 trichobothria.

COLOR (in alcohol): Compound eyes black, ocellar interval dark brown. Vertex uniformly medium brown except for two slender bands of yellowish white converging toward ocellar interval. Remainder of head, antennae, thoracic pleura, legs, and abdomen yellowish white. Lateral mesonotal lobes medium brown outlined in yellowish white. Anterior mesonotal lobe pale brown. Remainder of thoracic terga yellowish white. Forewings marked as in figure 53; hindwings unmarked except for two faint brown spots in cell Cu_2 and faint brown wash along the posterior wing margin.

Female. Measurements (three individuals):

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3.49	0.92	0.29	0.10	18	0.53	0.25	0.20	2.15	0.81
3.46	1.20	0.40	0.13	18	0.51	0.24	0.17	2.12	0.73
3.44	1.15	0.38	0.13	23	0.47	0.23	0.18	2.04	0.80

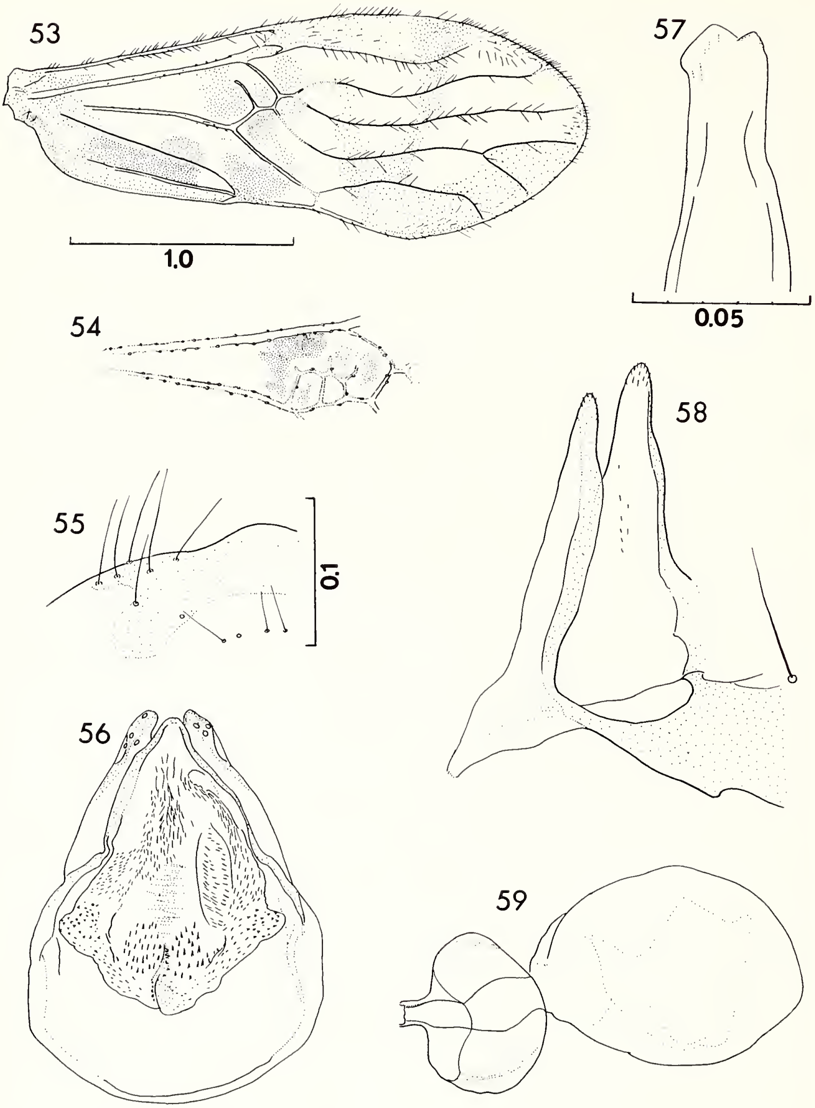
MORPHOLOGY: Mouthpart, leg, and wing characters same as in male, except in forewing of specimen examined several extra veins developed in cell R (fig. 54). Subgenital plate with pigmented area of two arms diverging anteriorly and strongly curved out at their apices. Free margin of plate with short median bare area flanked by long setae. Spermathecal gland broad and short, incompletely surrounding duct (fig. 59). Gonapophyses (fig. 58): first and second valvulae rounded and setulose apically; rudimentary third valvula absent. Sense cushion of paraproct with 23 trichobothria. Epiproct with peripheral arched row of ten long setae.

COLOR (in alcohol): Differing from male as follows: on each side a reddish brown band along propleuron bordering its dorsal edge, continuing on neck and on head, interrupted by compound eye, and continuing to antennal base. Vertex pale brown mottled with yellowish white. Abdomen red except pale brown on clunium, paraprocts, and base of epiproct; tip of epiproct red.

HOLOTYPE ♀: Cayamas, Cuba (Baker), in Museum of Comparative Zoology, Cambridge, Massachusetts.

RECORDS: Camagüey Prov.: Monte Imías nr. California, June 7, 1959, 1 ♂, 1 ♀, M.W.S. Oriente Prov.: Loma del Gato, Sierra Maestra, May 26–28, 1959, 2 ♀, M.W.S. Pinar del Río Prov.: Soroa, April, 1964, 1 ♀, F.Z.

DISCUSSION: The species is known from Cuba, Hispaniola, and Puerto Rico. There appear to be no consistent differences among the populations of the three islands.



FIGS. 53–59. Structures of *Polypsocus fasciatus* Banks. Fig. 53. ♂ forewing. Fig. 54. ♀ cell R of forewing, scale of Fig. 53. Fig. 55. ♂ hypandrium, left half. Fig. 56. ♂ phallosome, scale of Fig. 55. Fig. 57. ♀ lacinial tip. Fig. 58. ♀ gonapophyses, half scale of Fig. 57. Fig. 59. ♀ spermatheca, half scale of Fig. 57.

KEY TO THE GENERA AND SPECIES OF CUBAN AMPHIPSOCIDAE

1. Radial fork stem of forewing (Rs beyond rs-m crossvein) exceedingly short, its branches very long, nearly half length of forewing. M of forewing two-branched .... *Polypsocus*
(single Cuban species, *P. fasciatus* Banks)
Radial fork stem of forewing about as long as its branches, the latter decidedly less than a third length of forewing. M of forewing three-branched .... *Dasydemella*
(single Cuban species, *D. dezayasi*, new species)

FAMILY CAECILIIDAE ENDERLEIN

Caecilius antillanus Banks

C. antillanus Banks, 1938, p. 288.

DIAGNOSIS: A species of the *africanus* group (Mockford, 1966). Wings long and slender, length of forewing about 3.5 times greatest width. Body mostly yellow, head unmarked, wings clear.

This species was described adequately by Mockford (1966). Originally described from Cuba, it is widely distributed in the American Tropics (Mockford, 1966) and reaches Florida. All adult specimens known to me are females (81 specimens), suggesting that the species is parthenogenetic.

RECORDS: Las Villas Prov.: Soledad, Botanical Garden, 1, 2 April (Myers); 6 to 20 August (Banks) (type material); same locality, May, 1967, in grasses, 12 ♀, F.Z.

Caecilius indicator Mockford

C. indicator Mockford, 1969a, p. 103.

DIAGNOSIS: A species of the *caligonus* group (Mockford, 1966). Wings unbanded; body and wings yellow. Male vertex dark brown, that of female yellow. Differing from *C. dificilis* Mockford (Bahamas, Hispaniola, Puerto Rico) by relatively longer spermathecal gland (about 2.0 times as long as wide versus about 1.5 times as long as wide in *C. dificilis*).

This species was described adequately by Mockford (1969). It occurs throughout Florida and in the Bahama Islands. It is represented in the Cuban material by two females. Both possess the pterostigmal spur vein, which is rare in Floridian material.

RECORDS: Oriente Prov.: Gran Piedra nr. Santiago, May 30 to 31, 1959, 1 ♀, M.W.S.; same locality, June, 1967, 1 ♀, F.Z.

Caecilius tamiami Mockford

C. tamiami Mockford, 1965b, p. 150.

DIAGNOSIS: A species of the *flavidus* group (Mockford, 1965). Body color yellow, with no indication of lateral reddish brown stripe. Wings elongate and slender, male forewing slightly over 3.0 times as long as its greatest width.

This species was described adequately by Mockford (1965). Cuban material appears identical with the Florida material of this species.

RECORDS: Oriente Prov.: Cupeyal, Yateras, June, 1964, 1 ♂, F.Z.; Gran Piedra nr. Santiago, June, 1967, 1 ♀, F.Z.

Caecilius pulchellus, new species

DIAGNOSIS: A species of the *subflavus* group (Mockford, 1965). Similar to *C. subflavus* Aaron and *C. biminiensis* Mockford, but differing from both by presence of distinct spot in cell M_1 and another in base of cell M_3 of forewing.

Male. Measurements (head capsule lost after mouthparts removed):

FW	T	t_1	t_2	t_1ct
2313	770	274	95	19

MORPHOLOGY: Lacinial tip (fig. 61) nearly flat but showing slight median and slight lateral cusp. Phallosome (fig. 62) with base gently rounded, thickened; parameres tapering toward tips, each bearing minute pores over distal third. Hypandrium (fig. 66): free margin with short, slightly protruding median bare space flanked by two short setae and two much longer ones each side; two setae in about middle of hypandrium much longer than surrounding ones. Paraproctal papillar field (fig. 63) with papillae decidedly variable in size; short, acuminate spine on free margin near field (fig. 64). Epiproctal papillar field (fig. 65) of numerous relatively long papillae protruding at many angles; pair of long, curved setae just distad of field.

COLOR (in alcohol): Body color in general scarcely discernible due to poor preservation. Antennae apparently medium brown on scape and pedicel, lighter on flagellum, (but only first two flagellar segments present). Thoracic terga medium brown laterally with broad band of yellowish white down middle. Forewings (fig. 60) clear except for brown spot as follows: one in distal end of cell R narrowly separated from veins, one very diffuse in pterostigma bordering posterior angle, one in cell R_1 just outside of pterostigma and bordering its posterior angle, one in base of cell R_5 separated from veins, one in cell M_1 separated from veins, faint one in cell M_2, one in base of cell M_3 narrowly separated from veins, one surrounding distal two-thirds of cubital loop, one in cell Cu_{1b} near its middle but extending diffusely back to wing margin, one covering much of cell Cu_2, darkest in its distal half. Hindwings clear, unmarked.

HOLOTYPE ♂: Pinar del Río Prov.: Soroa, April, 1964, F.Z.

Caecilius flavibrunneus Mockford

C. flavibrunneus Mockford, 1969a, p. 87.

DIAGNOSIS: A species of the *subflavus* group (Mockford, 1965), but differing from other known members of group by absence of banding pattern in wings, having forewings heavily brown-washed, and having head dull creamy white marked with brown band on each side.

The species was described adequately by Mockford (1969). Outside of Cuba, it is known from New Providence Island, Bahamas.

RECORDS: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23 to 24, 1959, 1 ♀, M.W.S.; Moa, June 5, 1959, beating pines, etc., 1 ♀, M.W.S.

KEY TO THE CUBAN SPECIES OF CAECILIUS

1. Labrum at each anterolateral corner bearing slender, pointed stylet. Lacinial tip shallowly bicuspid. A yellow species usually found on grass and palm foliage .... (*africanus* group). .... *C. antillanus* Banks

Labrum without stylets. Lacinial tip either in form of two rounded lobes or distinctly bicuspid 2

2. Lacinial tip in form of two rounded lobes. Male with anterior and middle tibiae appearing at least slightly swollen. A yellow species generally on pine foliage .... (*flavidus* group) .... *C. tamiami* Mockford

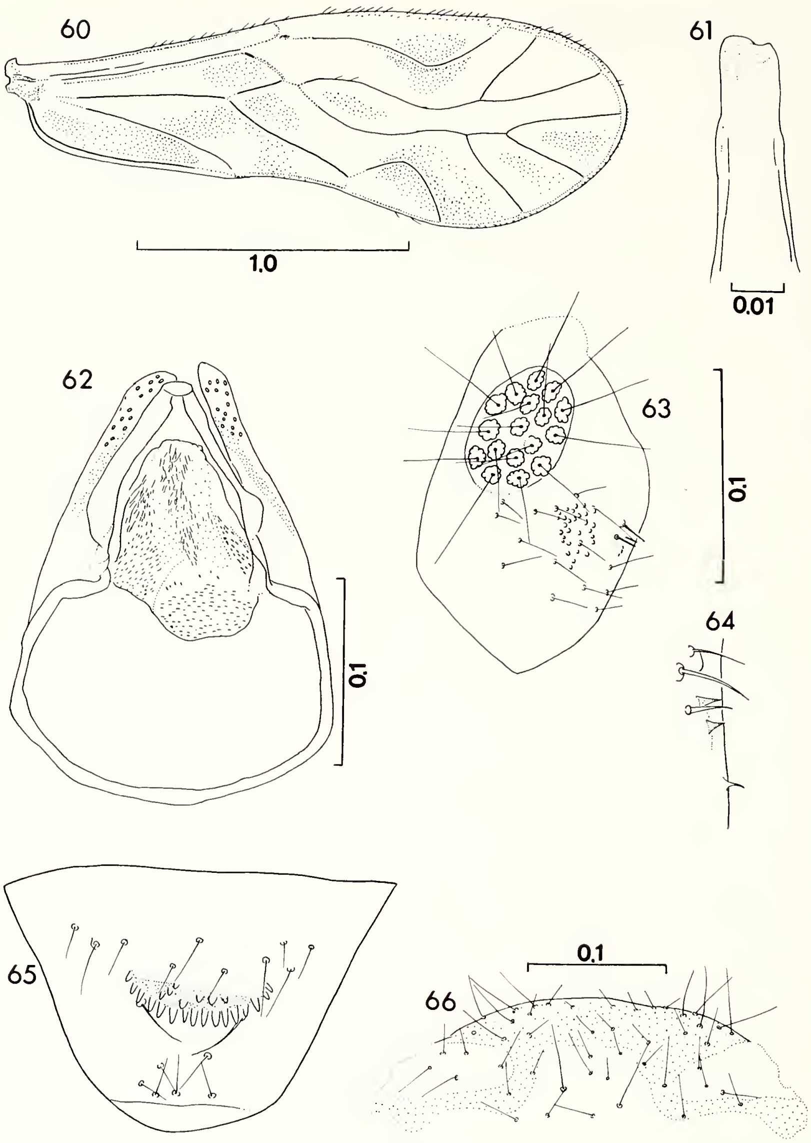
Lacinial tip bicuspid. Male with anterior and middle tibiae normal 3

3. Males and occasionally females with spur vein descending from apex of posterior angle of pterostigma; females without spur vein having posterior angle of pterostigma pointed at apex. A yellow species with vertex of head in male dark brown .... (*caligonus* group) .... *C. indicator* Mockford

No spur vein from apex of posterior angle of pterostigma. Male with vertex of head not darker than surrounding cuticle. Body and wings either predominantly brown or, if yellow, wings marked with distinct brown spots .... (*subflavus* group) 4

4. Forewings brown washed, the brown color only slightly accentuated below posterior angle of pterostigma and in base of cell R_5 .... *C. flavibrunneus* Mockford

Forewings with distinct brown spots on clear background, spots forming pattern as in figure 60 .... *C. pulchellus*, new species



FIGS. 60–66. Structures of *Caecilius pulchellus*, new species ♂. Fig. 60. Forewing. Fig. 61. Lacinial tip. Fig. 62. Phallosome. Fig. 63. Paraproct. Fig. 64. Free margin of paraproct distad of papillar field, scale of Fig. 61. Fig. 65. Epiproct, twice scale of Fig. 62. Fig. 66. Hypandrium.

FAMILY PHILOTARSIDAE PEARMAN

Aaroniella achrysa (Banks), new combination

Graphocaecilius achrysus Banks, 1941, p. 391.

DIAGNOSIS: With radial pattern of spots in forewing (fig. 67). Differing from other described species with this pattern as follows: from *A. maculosa* (Aaron) (eastern United States) by considerably smaller size; from *A. badonneli* (Danks) (Georgia Republic of Soviet Union) by somewhat smaller size (?) and broader cell R_5 of forewing; from *A. pulchra* Thornton (Hong Kong) by broader cell R_5 of forewing and more elongate distal piece of subgenital plate.

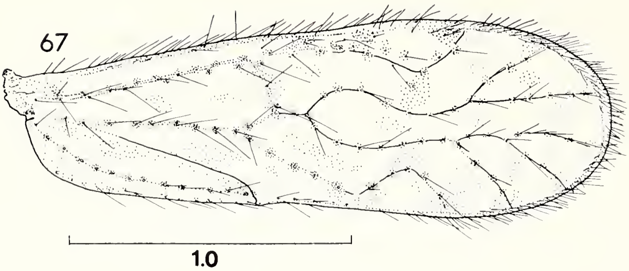
IDENTIFICATION: I examined cursorily the type of this species prior to receiving the Cuban material. At that time, I noted its position in *Aaroniella*, but I have not reexamined it for specific characters. The forewing length stated in the original description (1.8 mm) accords rather well with that in a series of *Aaroniella* specimens which I collected in Santo Domingo (2.04 to 2.30 mm for six specimens). Accordingly, I tentatively regard these as the same species as the type. These specimens were compared with the Cuban material and no difference was noted.

REDESCRIPTION: Female. Measurements:

	FW	T	t_1	t_2	t_3	$t_1$ct	IO	D	d	IO/D	PO
Cuba ♀	2164	788	258	67	57	9	393	176	116	2.23	0.66
Florida ♀	2254	784	255	73	59	12	409	171	123	2.39	0.72
Dominician Republic ♀	2145	807	270	63	67	10	400	182	121	2.20	0.66

MORPHOLOGY: Epicranial line present but not reaching ocellar interval; frontal lines absent. Head with scattered short setae, several long setae on vertex toward posterior margin near compound eyes. One long seta directed forward on postclypeus near lateral margin on each side. Lacinial tip (fig. 68) with relatively large median cusp, lateral cusp with a few low, rounded denticles. Terminal segment of maxillary palpus with two basiconic sensilla, the seta of each relatively long and slender. Distal flagellomere terminating in seta longer than the segment. Scattered long setae over entire antenna. A basiconic sensillum with pointed filament near tip of sixth and another near tip of tenth flagellomere. Each pretarsal claw (fig. 70) with slender, curved, slightly knobbed pulvillus and curved seta at base ventrally. Pterostigma with spur vein from its posterior angle. In hindwing R_1 setose its entire length, likewise median vein; radial fork stem nearly so. Subgenital plate (fig. 69) with pigmented arms poorly developed;

67



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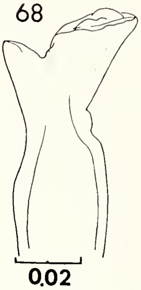

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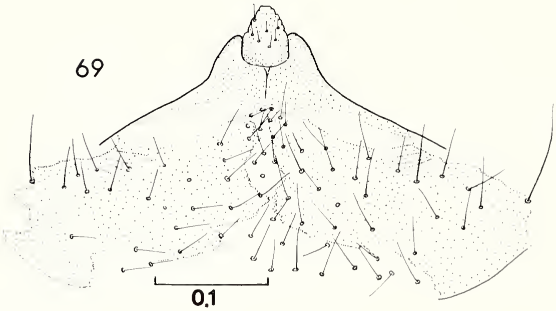

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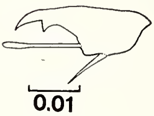

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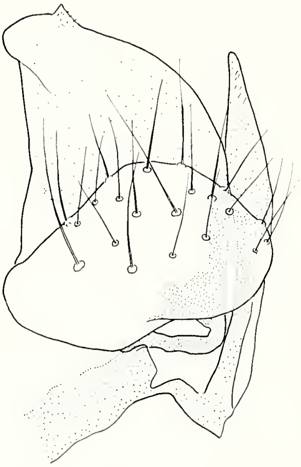

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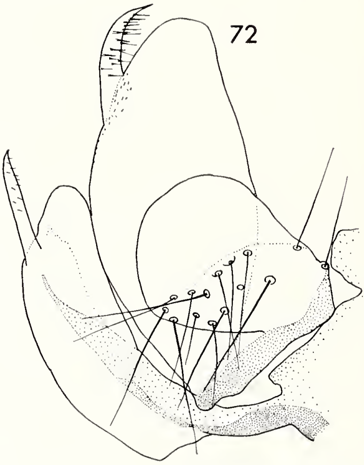


FIGS. 67–72. Structures of Cuban Philotarsidae and Pseudocaeciliidae. Figs. 67–71. *Aaroniella achrysa* (Banks) ♀. Fig. 67. Forewing. Fig. 68. Lacinial tip. Fig. 69. Subgenital plate. Fig. 70. Pretarsal claw. Fig. 71. Gonapophyses, half scale of Fig. 68. Fig. 72. *Cladioneura coriacea* (Roesler) ♀, gonapophyses, twice scale of Fig. 69.

bearing scattered setae except on its distal third, but bare area not separated by distinct line; terminal piece crenulate on its free margin, bearing six minute setae. Gonapophyses (fig. 71): first valvula gradually tapering from about middle to acuminate tip, the tip bearing basally-directed minute spinelets; second valvula with low, spinulose lobe near distal end; third valvula with scattered setae, two very long ones near base, 9 and 13 marginal setae in specimen examined. Epiproct and paraproct with scattered long setae; sense cushion with 13 and 14 trichobothria in specimen examined.

COLOR (in alcohol): Antennae color-banded as usual for the genus. Compound eyes and ocelli black. Ground color of body and head dull yellowish white. Head with broad band of medium brown spots along epicranial line and similar broad band bordering each compound eye. Postclypeus with several pairs of medium brown striae. Thoracic terga pale brown, slightly darker on anterior mesonotal lobe. Thoracic pleura medium brown with scattered purple pigment granules, especially concentrated below wing bases. Forelegs and middle legs each with broad medium brown basal band on femur and narrow subapical band of same color; tibia with subapical medium brown band. Hind femur entirely medium brown, tibia same as others. Forewing (fig. 67) with usual pattern for genus, spot in basal region of cell R_5 placed almost in constriction; another spot in this cell immediately distad of most constricted region but well basad of spot forming part of radial series. Spot in cell Cu_2 diffuse and more or less running length of cell. Hindwings unmarked. Abdomen irregularly blotched dorsally on preclunial segments with spots of purple pigment granules; these concentrated in line along each side and below this broad ventrolateral band on each side; subgenital plate and gonapophyses medium brown; clunium, epiproct, and paraprocts mottled with pale brown.

TYPE LOCALITY: Dominican Republic: San José de las Matas, 1000 to 2000 ft., P. J. Darlington Jr. The type is in the Museum of Comparative Zoology, Cambridge, Massachusetts.

RECORDS: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 6 ♀, 3 nymph, M.W.S.; Gran Piedra nr. Santiago, May 30–31, 1959, 1 ♀, M.W.S.; Loma del Gato, Sierra Maestra, May 26–28, 1959, 2 ♀, M.W.S. Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 2 ♀, M.W.S.

NOTE: The species also occurs in Florida north to Oleno State Park, Columbia County. All adult specimens on hand are females, and I found parthenogenetic reproduction in laboratory reared females from Alachua County, Florida.

FAMILY PSEUDOCAECILIIDAE PEARMAN

Pseudocaecilius citricola (Ashmead)

Psocus citricola Ashmead, 1879, p. 228. Complete synonymy in Smithers, 1967, p. 73.

DIAGNOSIS: Forewing membrane clear with brown band across pterostigma and another across areola postica. Differences from *P. elutus* Enderlein (Old World Tropics) and *P. formosanus* (Banks) (Taiwan) not known.

The species was described adequately by Chapman (1930). It occurs throughout the American Tropics, north through Mexico into southern Texas, and through most of Florida. The Old World species *P. elutus* Enderlein is very similar and may prove to be the same. Only females are known, and the species is probably parthenogenetic.

RECORD: Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

Cladioneura (Scytopsocus) coriacea (Roesler)

Scytopsocus coriaceus Roesler, 1940, p. 12.
Cladioneura coriaceus (Roesler): Roesler, 1944, p. 151.

DIAGNOSIS: Morphological differences between females of the two described species, *C.* (*S.*) *coriacea* (Roesler), and *C.* (*S.*) *difficilis* (Roesler), not known. Identification here based on geographic distribution, *C.* (*S.*) *difficilis* being known only from southern Brazil, and *C.* (*S.*) *coriacea* having been found north into southern Mexico.

The species was described adequately by Roesler (1940). As yet no males have been found in the Antilles. Material examined from Nova Teutonia, Brazil, as well as the Cuban material, shows the setae of the third valvula ending abruptly along a curved line about half the distance from the basal attachment point to the apical margin of the valvula (Fig. 72).

RECORDS: Camagüey Prov.: Monte Imías nr. California, June 7, 1959, 1 ♀, M.W.S. Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 5 ♀, M.W.S. Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 2 ♀, M.W.S.

KEY TO THE CUBAN GENERA AND SPECIES OF PSEUDOCAECILIIDAE

1. Setae of forewing located on veins, not to their sides. Pretarsal claws without preapical denticle. Cuban species predominantly yellow .... *Pseudocaecilius* (single Cuban species, *P. citricola* [Ashmead])

Setae of forewing located to sides of veins, generally not on them. Pretarsal claws each with preapical denticle. Color predominantly brown .... *Cladioneura* (*Scytopsocus*)
(single Cuban species *C.* (*S.*) *coriacea* [Roesler])

FAMILY ARCHIPSOCIDAE PEARMAN

Archipsocus panama Gurney

A. panama Gurney, 1939, p. 505 (Not *A. panama* Gurney: Mockford, 1953, p. 122).

DIAGNOSIS: As noted in key, and as follows: male with a field of heavy bristles to each side of midline on clunium. Free margin of hypandrium with heavy bristles laterally.

The species was described adequately by Gurney (1939). Cuban and middle American material differs from Floridian material which I previously assigned to this species by possession of heavy bristles laterally on the free margin of the hypandrium. Therefore, it appears that the Floridian form is a distinct species. Measurements of antennomeres of two Cuban females, the only Cuban females with antennae complete, are as follows:

S	P	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}
54	85	93	61	61	65	45	61	44	54	43	52	82
62	90	106	62	62	63	49	61	50	55	44	57	81

RECORD: Habana Prov.: Santiago de las Vegas, June, 1965, web in anona, 4 ♂, 15 ♀, F.Z.

Archipsocus floridanus Mockford (?)

A. floridanus Mockford, 1953, p. 116.

Although the Cuban specimens are paler than the Floridian material, they agree closely with the latter in the shape of the phallosome (except as noted below), shape of the subgenital plate, and antennal diagram. Two morphological differences were found: (1) the number of setae in the ventral half of the female paraproct is less in the Cuban specimens (15 and 20 in the two examined versus 25 to 29 in five Florida females), (2) the basal struts of the phallosome on their inner margins do not converge near the base before meeting at the base. As variation in these characters in the Cuban material is not yet understood, they do not seem to warrant specific distinction at present.

RECORDS: Habana Prov.: Marianao, June, 1967, webs on tree trunks, 1 ♂, 3 ♀, F.Z.

Archipsocopsis species

This species is represented by a single macropterous female in very bad condition. It appears to be intermediate in size between the two described Floridian species *A. frater* Mockford and *A. parvulus* Mockford. I decline to describe it as new until additional material is available.

RECORD: Oriente Prov.: Yateras, June 1, 1959, M.W.S.

Pseudarchipsocus, new genus

DIAGNOSIS: Forewing with venation of *Archipsocus*, but vein IIA, absent in *Archipsocus*, weakly represented and apparently joining IA. Differing from *Archipsocus* by vivipary and by possession of only single pair of gonapophyses, the setose third valvulae, these not as wide as in *Archipsocus*. Differing from *Archipsocopsis* by possession of gonapophyses and by having discoidal sensilla at distal ends of flagellomeres 6 and 10 each bearing central filament. Differing from both *Archipsocus* and *Archipsocopsis* by having lacinial tip tridentate (fig. 75) and by lack of closed cell in hindwing.

TYPE SPECIES: *P. guajiro*, new species.

Pseudarchipsocus guajiro, new species

DIAGNOSIS: With characters of genus.

Macropterous female. Measurements:

FW	F	T	t_1	t_2	IO	D	d	IO/D	PO
1857	500	683	171	105	454	169	88	2.68	0.52

Antenna:

S	P	f_1	f_2	f_3	f_4	f_5	f_6	f_7	f_8	f_9	f_{10}	f_{11}
68	113	231	100	102	95	92	88	86	84	84	81	109

MORPHOLOGY: f_1 with two discoidal sensilla in basal half; f_4 with a discoidal sensillum at distal three-fourths bearing short cone; other discoidal sensilla as in generic diagnosis. Middle denticle of lacinial tip placed closer to lateral than to median one. Distal segment of maxillary palpus bearing one short, thin walled trichoid sensillum just basad of half length of segment. Labrum with well developed stylets. Conspicuous discoidal sensillum near each lateral extreme of prementum (homolog in *Archipsocus* is a macrotrich). In forewing (fig. 73), pterostigma distinct only at base; branches of Rs distinct but not reaching wing margin. Hindwing (fig. 74) with anterior margin sparsely ciliated except in middle and in distal third; posterior margin thrown into distinct lobe basad of end of Cu_2. Setae of third valvula (fig. 77) mostly distant from margin; one seta longer than others, but long seta not occupying same position on valvulae of the two sides. Subgenital plate (fig. 78) as in *Archipsocus*. Epiproct (fig. 76a) triangular. Paraproct (fig. 76b) with no trace of sense cushion but with well developed field of short, posterodorsally directed setae in ventral half.

COLOR (in alcohol): Compound eyes and ocellar interval black. Remainder of head and thorax medium tawny brown. Wings clear, colorless except *stigmasac* in forewing conspicuous dark brown spot, and pterostigma brown basally. Legs and antennae yellowish white. Membranous portion of abdomen apparently without cuticular pigment but suffused with purplish brown subcuticular pigment. Clunium and terminal regions pale brown; clunium with purplish brown subcuticular pigment.

HOLOTYPE: Macropterous ♀, Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, M.W.S.

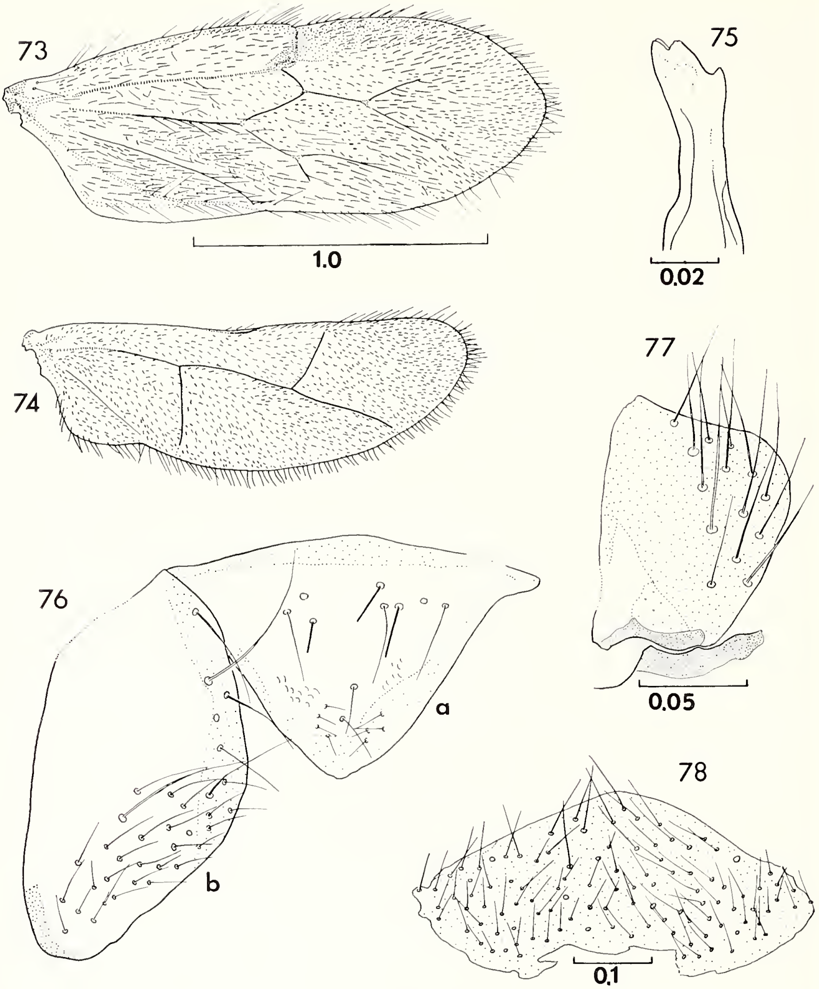
KEY TO THE GENERA AND SPECIES OF CUBAN ARCHIPSOCIDAE

1. Males long winged. Females with single pair of gonapophyses, the slightly reduced, setose third valvulae; viviparous (i.e., gravid females containing embryos) .... *Pseudarchipsocus*, new genus (single Cuban species *P. guajiro*, new species)
   Males short winged or wingless. Females either with two pairs of gonapophyses and oviparous or with no gonapophyses and viviparous 2
2. Discoidal sensilla of flagellomeres 6 and 10 each with very small central cone. Females with no gonapophyses and viviparous .... *Archipsocopsis* (single Cuban species undetermined)
   Discoidal sensilla of flagellomeres 6 and 10 each with central filament. Females with two pairs of gonapophyses and oviparous .... *Archipsocus* 3
3. Head in dorsal view broad and short with postclypeus relatively narrow and inconspicuous. Phallosome with parameres not joined basally .... *A. panama* Gurney
   Head in dorsal view at least as long as wide, with postclypeus bulging and somewhat wider than region of head immediately basal to it. Phallosome with parameres joined basally .... *A. floridanus* Mockford (?)

FAMILY LACHESILLIDAE BADONNEL

Graphocaecilius normalis, new species

DIAGNOSIS: Differing from *G. trypetoides* Enderlein and *G. in-*



FIGS. 73–78. Structures of *Pseudarchipsocus quajiro*, new genus, new species ♀. Fig. 73. Forewing. Fig. 74. Hindwing. Fig. 75. Lacinial tip. Fig. 76a. Epiproct, b. paraproct, half scale of Fig. 75. Fig. 77, Gonapophyses. Fig. 78. Subgenital plate.

terpretatus Roesler in lack of wing markings. Differing from *G. luridus* Enderlein in smaller size (forewing length of type 1.99 mm. versus 2.8 mm. in *G. luridus*) and fewer ctenidia on posterior t_1 (17 in type versus 21 in *G. luridus*). Differing from *G. enderleini* Williner and *G. citramans* Williner by much smaller size (*G. citramans* is probably a species of *Dasydemella*).

Female. Measurements:

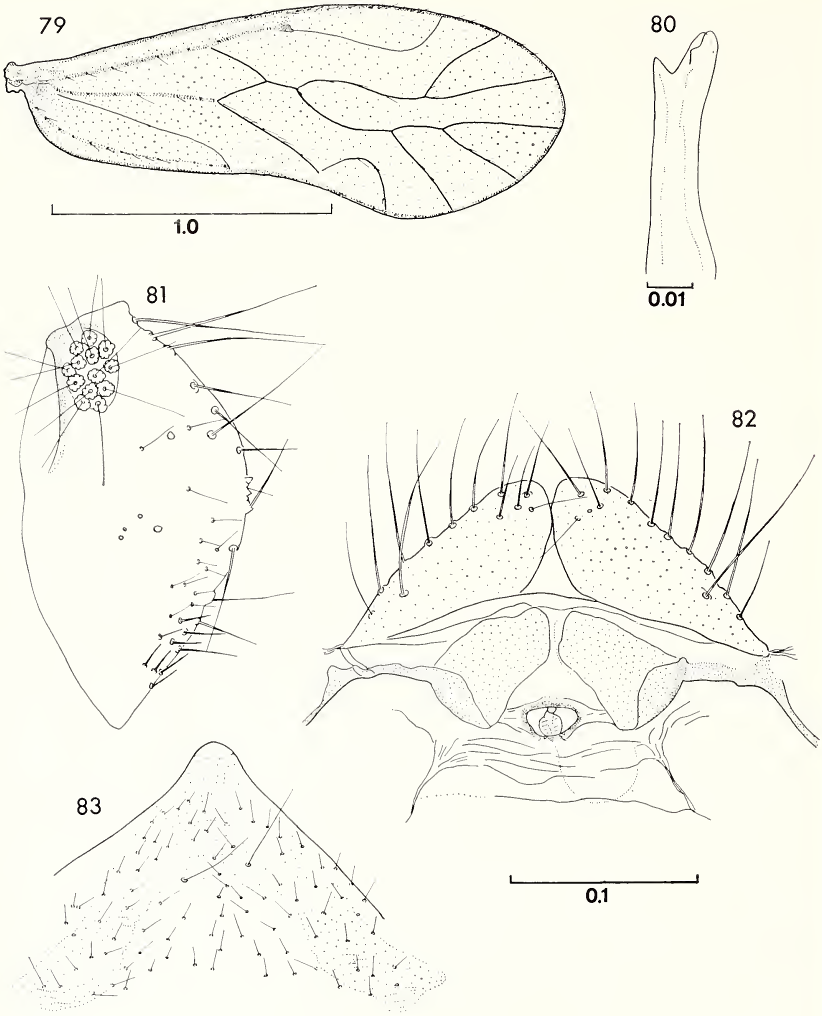
f_1	f_2	f_3	FW	F	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
336	220	178	1990	395	691	233	100	17	287	193	107	1.49	0.55

Morphology: Ocelli absent. Antennal sensilla: f_1 with three discoidal sensilla each with raised edges and small central cone in basal sixth of segment; discoidal sensillum near distal end of f_4; scattered small trichoid sensilla on all flagellomeres present (f_1 to f_5). Short, broad labral stylets present. Lacinial tip (fig. 80) bifid; long lateral tyne slightly subdivided at tip. Pretarsal claw with preapical denticle, pulvillus of medium width, and basal short seta. Pearman's organ (rasp and mirror) present on posterior coxa. Forewing with sparse, scattered setae on all veins and around anterior and distal margin to end of Cu_{1a} on posterior margin. Hindwing without setae. Subgenital plate (fig. 83) with weakly differentiated distal lobe and pigmented arms, the latter curving outward at anterior ends. Setae scattered over surface of plate but two in middle area much longer than others. Gonapophyses (fig. 82) forming close ensemble with ninth sternum; third valvulae setose, each with rank of long setae along lateral edge; a lobe closely appressed to median edge of each third valvula probably representing second valvula; stem of first valvula conspicuous and joined to bases of other two valvulae. Ninth sternum (fig. 82) with median sclerotized ring around spermapore and sclerotized band on each side from ring to first valvular stem. Sense cushion of paraproct (fig. 81) small, with 13 trichobothria (each side) and seta without basal floret; three to four long setae on inner margin of paraproct adjacent to sense cushion; middle inner margin of paraproct bearing two short hyaline cones in addition to long setae; lower inner margin with broad band of setae directed posterodorsally. Epiproct with long outer setae and shorter median setae.

Color (in alcohol): Compound eyes black. Body, appendages, and wing veins tawny brown. Membranous portions of abdomen suffused with purplish brown pigment. Wing membranes with slight tawny cast, unmarked (forewing, fig. 79).

Holotype ♀ And 1 ♀ Paratype: Oriente Prov.: Loma del Gato, Sierra Maestra, May 26–28, 1959, M.W.S.

Paratypes: Las Villas Prov., Topes de Collantes, Sierra de Trinidad, June 11, 1959, 1 ♀, M.W.S. Oriente Prov., Gran Piedra nr. Santiago, May 30–31, 1959, 1 ♀, M.W.S.



FIGS. 79–83. Structures of *Graphocaecilius normalis*, new species ♀. Fig. 79. Forewing. Fig. 80. Lacinial tip. Fig. 81. Paraproct, scale of Fig. 82. Fig. 82. Gonapophyses and ninth sternum. Fig. 83. Subgenital plate, half scale of Fig. 82.

Lachesilla aethiopica (Enderlein)

Pterodela pedicularia var. *aethiopica* Enderlein, 1902, p. 11.
Lachesilla aethiopica (Enderlein): Badonnel, 1949b, p. 53.

DIAGNOSIS: A species of the *pedicularia* group (Garcia-Aldrete, 1972), differing from other species of group known from both sexes as follows: male paraprocts each with mesial prong or acuminate tubercle on inner margin; male epiproct with median posterior extension in the form of broad lobe; distal part of clasper slender, lacking process on its outer edge.

The female of this species was described adequately by Badonnel (1949b). The male remains undescribed. This African species was recorded by Garcia-Aldrete (1972) from Florida, eastern Mexico, and the West Indian islands of Trinidad, Hispaniola, Jamaica, and Puerto Rico. Thus, its occurrence in Cuba is not surprising.

RECORD: Pinar del Río Prov.: Soroa, April, 1964, 1 ♀, F.Z.

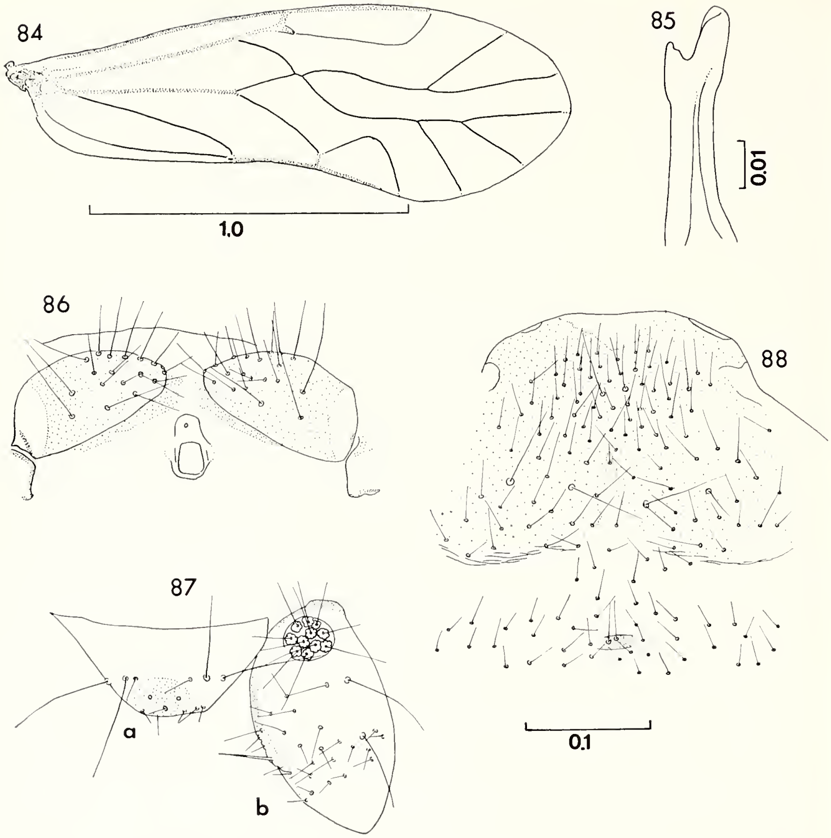
Lachesilla sandersoni, new species

DIAGNOSIS: A species of the *forcepeta* group (Garcia-Aldrete, 1972). Differing from other species of group by following combination of characters: subgenital plate virtually unpigmented, very slightly bilobed posteriorly, without underlying sclerotizations, and bearing four mesial macrosetae. Gonapophyses about 2.25 times as long as broad. Spermapore plate forming well sclerotized ring around spermapore and perforated by minute pore posterior to spermapore.

Female. Measurements:

FW	F	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
1763	322	432	144	92	9	317	185	127	1.72	0.69

MORPHOLOGY: The f_1 with two discoidal sensilla in basal eighth. Lacinial tip (fig. 85) bifid with small subapical denticle on inner tyne and outer tyne slightly subdivided at apex. Labrum with stylets (probably universal in the genus). Forewing (fig. 84) with short R–M fusion. Subgenital plate (fig. 88) as described in diagnosis. Sixth and seventh sterna each with small plate in middle bearing two macrosetae. Gonapophyses (fig. 86) broad basally, increasing in width toward middle, then tapering to rounded apex; bearing three long setae mesially and several shorter setae near and on lateral margin. Spermapore plate (fig. 86) as described in diagnosis. Ninth sternum with sclerotized band on each side subtending gonapophyses. Paraproct (fig. 87b) with numerous scattered setae including two larger than others near long base; free margin bearing very low duplex cone subtended by stout seta; sense cushion with ten trichobothria and one seta without basal floret. Epiproct (fig. 87a) with transverse row of setae across its middle, two long setae near distal end, and scattered shorter setae, all in posterior half.



FIGS. 84–88. Structures of *Lachesilla sandersoni*, new species ♀. Fig. 84. Forewing. Fig. 85. Lacinial tip. Fig. 86. Gonapophyses and ninth sternum, scale of Fig. 88. Fig. 87a. Epiproct, b. paraproct, scale of Fig. 88. Fig. 88. Subgenital plate and preceding sternum.

COLOR (in alcohol): Compound eyes black. Head, thorax, and legs pale tawny brown. Vertex with three anteroposterior bands of slightly darker brown, one along mid-line, other two bordering eyes. Dark purplish brown spot below each antennal base. Abdomen yellowish white; preclunial segments each with slender dark purplish brown ring, rings broadily interrupted ventrally. Wings clear, unmarked, with slight tawny cast.

HOLOTYPE: ♀, Pinar del Río Prov., Aspiro-Rangel, June 16, 1959, M.W.S.

PARATYPES: Oriente Prov., Moa, June 5, 1959, 4 ♀, M.W.S.

KEY TO THE GENERA AND SPECIES OF CUBAN LACHESILLIDAE

1. In forewing a single rank of setae along all veins except Cu_2 and around entire wing margin .... *Graphocaecilius*
(single Cuban species, *G. normalis*, new species)
In forewing, setae, if any, minute and sparse, not readily visible with dissecting microscope .... *Lachesilla* 2
2. Gonapophyses broad basally, each tapering evenly to blunt tip. Spermapore sclerite bearing minute perforation posterior to spermapore .... *L. sandersoni*, new species
Gonapophyses of even width to near tip where each forms lateral shoulder and tapers to acute point. Spermapore sclerite without perforation posterior to spermapore .... *L. aethiopica* (Enderlein)

FAMILY PERIPSOCIDAE PEARMAN

Peripsocus pauliani Badonnel

P. pauliani Badonnel, 1949b, p. 56.

DIAGNOSIS: Forewing obscurely marked with darker grayish brown regions along most veins on paler grayish brown background (Badonnel, 1949b, fig. 56). Subgenital plate (Badonnel, 1949b, fig. 57) with distal process longer than wide; lateral arms of pigmented area pointed anteriorly.

This species was described adequately by Badonnel (1949b). It was originally described from the Ivory Coast. Thornton and Wong (1968) recorded it from several localities in the Oriental Region and the Pacific. Although it has not previously been noted from the Western Hemisphere, material is on hand from southern Florida, Mexico, Puerto Rico, Jamaica, Surinam, French Guiana, and Brazil.

RECORDS: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 2 ♀, 1 nymph, M.W.S.; Guantánamo Bay, U. S. Naval Base, Feb. 18–19, 1965, black light trap, 1 ♀. Pinar del Río Prov.: Viñales, Sept., 1966, in pine, 1 ♀, F.Z.

Peripsocus stagnivagus Chapman

P. stagnivagus Chapman, 1930, p. 376.

DIAGNOSIS: Forewing uniformly pale grayish brown except for darker marks of same color: a spot in base of cell R_5 and another covering most of cells M_1 and M_2 and extending into M_3 and R_5 (Chapman, 1930, pl. XXI, fig. 5). Subgenital plate (Chapman, 1930, pl. XIX, fig. 5) with distal process about as long as wide, lateral arms of pigmented area slender.

This species was described adequately by Chapman (1930). It is known from southeastern United States and numerous (unpublished) localities in Mexico.

RECORD: Pinar del Río Prov.: Viñales, Sept., 1966, in pine, 1 ♀, F.Z.

KEY TO THE CUBAN SPECIES OF PERIPSOCUS

1. Lateral arms of pigmented area of subgenital plate each terminating anteriorly as acuminate point .... *P. pauliani* Badonnel
   Lateral arms of pigmented area of subgenital plate terminating bluntly .... *P. stagnivagus* Chapman

FAMILY ECTOPSOCIDAE EICHLER

Ectopsocus pictus, new species

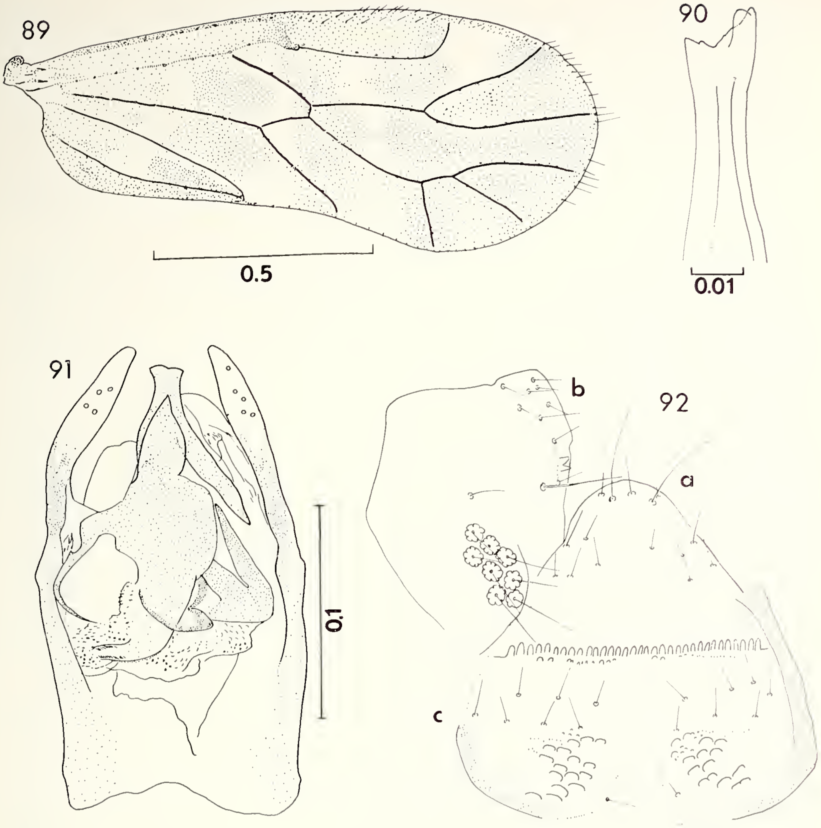
DIAGNOSIS: Forewings with extensive marking pattern (fig. 89) of discrete dark spots on pale background, as in *E. baliosus* Thornton and Wong, *E. machadoi* Badonnel, and *E. strauchi* Enderlein. Differing from *E. baliosus* in having no pale spot at distal end or in middle of cell R_5, much larger dark spot in basal half of cell M_3, and discrete basal and distal dark spot in cell Cu_2. Differing from *E. machadoi* in having dark spots in general more restricted, pterostigma not bordered with dark distally, no pale spot in distal end of cell R_5, and aedeagal arch much more narrow at apex. Differing from *E. strauchi* in having dark spots in general more widespread and dark areas at ends of veins R_1 through M_3 continuous with dark areas more remote from wing margin rather than forming discrete marginal spots.

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
1353	491	179	82	12	293	184	130	1.59	0.71

MORPHOLOGY: Ocelli large. Lacinial tip (fig. 90) bifid; lateral tyne much larger than median and slightly bifid at tip; median tyne with minute preapical denticle. Forewing with large *stigmasac*. Relatively long setae around wing margin and regularly but sparsely spaced on all veins except Cu_2. Setae on hindwing margin present from end of vein R_1 to end of R_{4+5}. A long r-m crossvein present in hindwing.

Terminal abdominal segments: Phallosome (fig. 91) open basally; external parameres long, slender, tapering, beset with several pores; aedeagal arch with elongate, slender apex bifid distally; endophallus including several complexly folded sclerites. Clunium with comb of 33 blunt teeth (fig. 92c) and basally from comb on each side of mid-line a field of broad tubercles. Paraproct (fig. 92b) with dis-



Figs. 89–92. Structures of *Ectopsocus pictus*, new species ♂. Fig. 89. Forewing. Fig. 90. Lacinial tip. Fig. 91. Phallosome. Fig. 92a. Epiproct, b. paraproct, c. middorsal region of clunium.

tinct bifid marginal cone; sense tubercle with eight trichobothria and one seta without basal floret. Epiproct (fig. 92a) with two large setae near apex flanking shorter seta arising from large follicle; several small setae scattered over surface near margin. Hypandrium with heavily sclerotized strap bordering each side; its posterior margin approximately straight and bearing several long setae.

Color (in alcohol): Compound eyes black. Head and thorax medium brown. Legs and antennae pale brown. Abdomen (contracted) dull white, mottled with faint purplish brown—possibly banded in fifth to seventh segments. Sclerotized terminal segments medium brown. Forewings complexely marked (fig. 89); hindwings clear, unmarked.

HOLOTYPE ♂: Oriente Prov.: Ciudamar, Santiago de Cuba, June 1967, F.Z.

Ectopsocus maindroni Badonnel

E. maindroni Badonnel, 1935, p. 81. Complete synonymy in Smithers, 1967, p. 66.

DIAGNOSIS: Forewings clear, unmarked, but vein M_3 slightly accentuated. Phallosome terminating distally in piece in shape of bicornered hat (Badonnel, 1946, fig. 93). Subgenital plate with lateral lobes each truncated at tip, the tip bearing two setae (Badonnel, 1935, fig. 12).

The female of this species was described adequately by Badonnel (1935) and the male by the same author (1946). Originally described from Arabia, it was recorded from several localities in southeastern Asia and the Pacific (Thornton and Wong, 1968), and is known in the Western Hemisphere from southern Florida, coastal Texas, the Gulf coast in Mexico, Jamaica, Puerto Rico, Venezuela, Guyana, and French Guiana (Mockford, 1965a).

RECORD: Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

Ectopsocus titschacki Jentsch

E. titschacki Jentsch, 1939, p. 120.
E. gabelensis Badonnel, 1955, p. 185.

DIAGNOSIS: Forewing clear, unmarked except slight spot on vein M_3 at wing margin. Endophallic sclerotizations dominated by two large claw-like processes (Badonnel, 1949b, fig. 59). Subgenital plate (Jentsch, 1939, fig. 12) with lateral lobes tapering gradually to tips, each bearing large seta at tip.

This species was described adequately by Jentsch (1939) and Badonnel (1949a). It is known from several localities in West Africa (Ball, 1943; Badonnel, 1949, 1969), Palawan and Hawaii (Thornton and Wong, 1968), and in the American Tropics from Puerto Rico, Trinidad (West Indies), Surinam, Guyana, French Guiana, Brazil (Mockford, 1965a), and tentatively Venezuela (Jentsch, 1939). I have unpublished records from Martinique, Dominica, Mexico, and Guatemala.

RECORDS: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 1 ♀, M.W.S. Pinar del Río Prov.: San Vincente, Sierra del Rosario, June 17, 1959, 4 ♂, 4 ♀, M.W.S.

Ectopsocus vilhenai Badonnel

E. vilhenai Badonnel, 1955, p. 189.

DIAGNOSIS: Forewings clear, unmarked. Subgenital plate (Badonnel, 1955, fig. 427) with lateral lobes each terminating in short, pointed process. Phallosome (Badonnel, 1955, fig. 424) bearing ventral arm articulated at base and extending nearly half distance to tip.

This species was described adequately by Badonnel (1955). It has been recorded in the literature only from Angola. I have seen material from the following areas in the American Tropics: Mexico, Venezuela, Trinidad (West Indies), and Puerto Rico.

RECORD: Oriente Prov.: Loma del Gato, Sierra Maestra, May 26–28, 1959, 1 ♀, M.W.S.

Ectopsocopsis cryptomeriae (Enderlein)

Ectopsocus cryptomeriae Enderlein, 1907, p. 100. Complete synonymy in Thornton and Wong, 1968, p. 26.

DIAGNOSIS: Forewings unmarked, iridescent in living and dried specimens. Male clunial sclerotizations somewhat in shape of plow (Chapman, 1930, pl. XIX, fig. 4). Female with elaborate sclerotizations around spermapore (Chapman, 1930, pl. XIX, fig. 12).

The species was described adequately by Chapman (1930) under the name *Ectopsocus pumilis* (Banks). Originally described from Japan, it has been recorded in several localities in southeastern Asia and the Pacific (Thornton and Wong, 1968). It is also known from the Caucasus (Danks, 1955). In America it is common in southeastern United States (Chapman, 1930) and has been found in northern Mexico (Mockford, 1965a).

RECORDS: Camagüey Prov.: Monte Imías nr. California, June 7, 1959, at light, 1 ♂, M.W.S. Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 1 ♀, M.W.S.; Gran Piedra nr. Santiago, May 30–31, 1959, 1 ♂, M.W.S.; La Siberia, Sierra Maestra, June, 1967, 1 ♀, F.Z. Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

KEY TO THE GENERA AND SPECIES OF CUBAN ECTOPSOCIDAE

1. Gonapophyses reduced to rudiments of third valvulae; male clunium bearing complex attachment organ involved in copulation .... *Ectopsocopsis* (single Cuban species *E. cryptomeriae* (Enderlein)
   Gonapophyses complete; male clunium bearing only apical comb .... *Ectopsocus* 2

2. Forewing with an extensive pattern of spotting (fig. 89) .... *E. pictus*, new species
   Forewing unmarked or at most with a few small spots bordering veins at wing margin 3
3. Head and thoracic terga medium to dark brown. Forewing length greater than 1.5 mm .... *E. vilhenai* Badonnel
   Head and thoracic terga dull yellowish white. Forewing length less than 1.5 mm 4
4. Male clunial comb continuous in middle; female subgenital plate with lateral lobes each tapering gradually to tip, the tip bearing single seta .... *E. titschachi* Jentsch
   Male clunial comb interrupted in middle; female subgenital plate with lateral lobes each truncated at tip, the tip bearing two setae .... *E. maindroni* Badonnel

FAMILY HEMIPSOCIDAE PEARMAN

My reasons for placing this Family in Psocetae instead of Homilopsocidae, where other recent authors have placed it, will be discussed in a separate note.

Hemipsocus pretiosus Banks

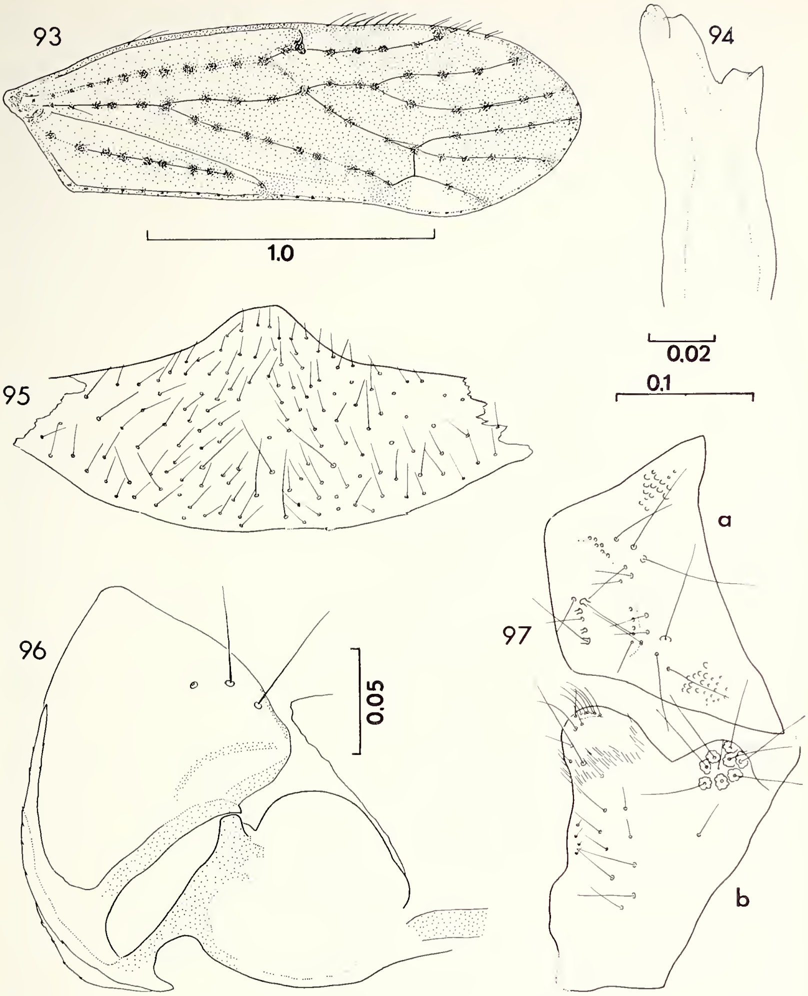
H. pretiosus Banks, 1930, p. 184.

DIAGNOSIS: A species with spots at bases of setae on veins in forewing but differing from other species with this character by having forewing heavily marked with colorless spots on brown background (fig. 93).

REDESCRIPTION: Female. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
2034	935	400	128	17	529	181	111	2.92	0.61

MORPHOLOGY: Antennal flagellum bearing numerous setae of variable lengths and stoutness; flagellum sculptured with transversely oriented areoles; f_1 bearing discoidal sensillum near its base. Labrum bearing short, stubby stylets. Lacinial tip (fig. 94) bifid; lateral tyne shallowly subdivided near apex, median subdivision slightly roughened on surface; median tyne also shallowly subdivided and lateral subdivision with roughened surface. Forewing with pterostigma decidedly narrow—broadest in basal fourth, becoming narrower from there to tip; Rs and M joined at a point. Segment of M from M-Cu branching to Rs-M junction very long, about as long as M-Cu; cells R_3 and M_1 long and narrow, their bordering veins diverging very little toward distal ends; anal angle distinct and marked by thickening of the wing margin.



FIGS. 93–97. Structures of *Hemipsocus pretiosus* Banks ♀. Fig. 93. Forewing. Fig. 94. Lacinial tip. Fig. 95. Subgenital plate, half scale of Fig. 97. Fig. 96. Gonapophyses. Fig. 97a. Epiproct, b. paraproct.

External genitalia and abdominal tip: subgenital plate (fig. 95) approximately triangular, the rounded apex of triangle formed by posterior margin of plate; plate nearly uniformly pigmented on stained preparation; sixth and seventh sterna with broad, pigmented central regions. Gonapophyses (fig. 96) typical of genus, the broad third valvulae each bearing three setae toward outer margin; basal region of gonapophyses set off from remainder of clunium by line. Epiproct (fig. 97a) truncated distally, divided into basal and distal regions by arc (depressed line in ventral surface only?) paralleled by row of closely set short setae (ventral surface); dorsal surface bearing scattered setae of various lengths; near each basal angle a small field of tubercular and scale-like sculpturing. Paraproct (fig. 97b) with median internal lobe bearing brush of filaments on inner surface, scattered setae and short trichoid sensilla on outer surface and row of curved setae distally; sense cushion with eight trichobothria and central seta without basal floret.

COLOR (in alcohol): Compound eyes black; ocelli ringed internally with purplish brown. Vertex, clypeus, and pronotum yellowish brown; genae, thoracic pleura and legs dusky brown. Preclunial abdominal segments heavily mottled with purplish brown subcuticular pigment. Subgenital plate, sclerotized portions of sixth and seventh sterna, clunium and anal lobes dusky brown. Forewings (fig. 93) marked along veins with alternating dark brown and colorless spots; except at these spots, most of margin medium brown but marked by semicolorless regions bordering wing margin in cells R_1, R_3, M_1, M_2, Cu_{1a}, and Cu_{1b}. Hindwing unmarked.

DISTRIBUTION: In addition to Cuba, the species is known from southern Florida.

RECORDS: Camagüey Prov.: Monte Imías nr. California, June 7, 1959, 1 ♀, M.W.S. Las Villas Prov.: Soledad, 18 Feb. (Myers) (Cotype, sex not det.). Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 8 ♀, 1 nymph, M.W.S. Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

FAMILY MYOPSOCIDAE ENDERLEIN

Myopsocus sparsus (Hagen) (?)

Psocus sparsus Hagen, 1861, p. 8. Complete synonymy in Smithers, 1967, p. 121.

Comparison with my figures of Hagen's type suggests the single Cuban specimen at hand to be the same species. The species occurs throughout southeastern United States. I anticipate redescribing it in a separate publication.

RECORD: Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

Myopsocus clypeofasciatus, new species

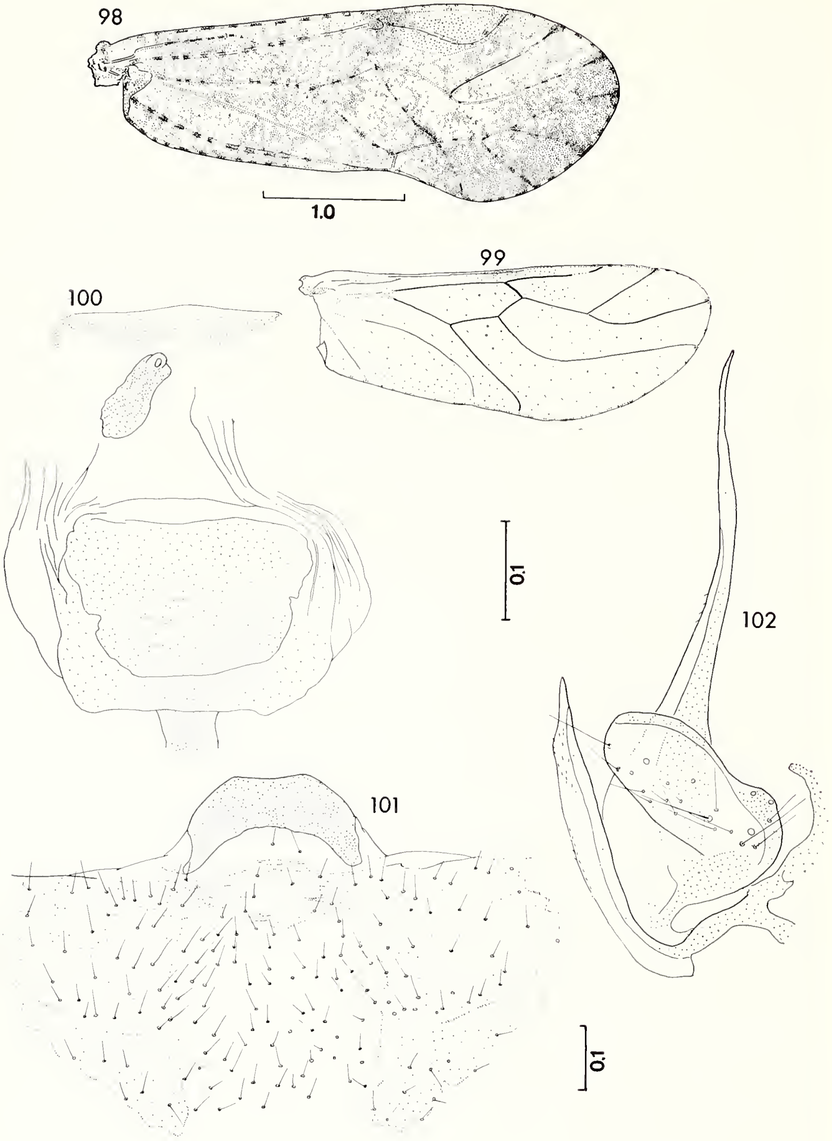
DIAGNOSIS: Differing from the African species *M. fasciatus* (Badonnel) and *M. schoutedeni* (Badonnel) in having forewing band from base of pterostigma to margin in anal cell intermediate in its definition—much less definite than in *fasciatus* and decidedly more definite than in *schoutedeni.* Differing from other described African species (*M. cameruna* Enderlein, *M. intermedia* [Pearman], *M. pauliani* [Badonnel]), the described species of eastern United States (*M. lugens* [Hagen], *M. sparsus* [Hagen]) and seven undescribed species of eastern United States in having posterior femur entirely dark brown.

Female. Measurements:

FW	T	t_1	t_2	t_3	$t_1$ct	IO	D	d	IO/D	PO
3.70	1.43	0.52	0.06	0.09	22	0.49	0.30	0.23	1.61	0.76

MORPHOLOGY: In forewing Rs and M fused a short distance; M touching apex of areola postica at a point. In hindwing, r-m crossvein about half length of Rs stem. Subgenital plate (fig. 101) with basal pigmented area of two lateral triangular pieces narrowly joined posteriorly, the clear area between triangles roughly parallel sided; distal sclerotized piece arched, flat posteriorly, bearing no setae. Ninth sternum (fig. 100) bearing broad anterior sclerite and two narrow, transverse posterior sclerites. Gonapophyses (fig. 102): first valvula constricted near tip; third valvula well sclerotized along basal and dorsal margins; latter margin flexuous. Paraproct with band of fine setae along inner margin, row of long setae along middle ridge plus other scattered setae; sense cushion with 25 trichobothria. Epiproct with arc of setae from near base on each side across middle, arc including four macrosetae posteriorly; apex of epiproct bearing a few setae.

COLOR (in alcohol): Compound eyes black. Body in general creamy yellow irregularly and extensively marked with dark brown and purplish brown spots. A band of dark spots along midline of head from posterior head margin, interrupted behind and in front of ocellar interval and continuing through entire postclypeus. A purplish brown spot in middle of each parietal region; another to each side of and touching ocellar interval; another along each frontal line in front of compound eye. Genae extensively dark brown. Pterothoracic terga mostly dark brown; a purplish brown line bordering each mesoparapsidal suture, and mesoscutellum purplish brown. A dark brown band through middle of mesopleuron. Anterior coxae creamy yellow; middle and posterior coxae dark brown. Anterior femora creamy yellow with dark brown distal ring; middle femora missing; posterior femora entirely dark brown. Preclunial abdominal segments largely



FIGS. 98–102. Structures of *Myopsocus clypeofasciatus*, new species ♀. Fig. 98. Forewing. Fig. 99. Hindwing. Fig. 100. Ninth sternum, scale of Fig. 102. Fig. 101. Subgenital plate. Fig. 102. Gonapophyses.

creamy yellow; first two terga extensively purplish brown; this color continuing posteriorly as broken band of blotches along each side of midline. Peri-anal lobes and clunium dorsally creamy yellow; clunium laterally, subgenital plate and well sclerotized portions of gonapophyses dark brown. Wings as in Figs. 98 and 99.

Holotype ♀: Pinar del Río Prov.: Soroa, Apr., 1964, F.Z.

Phlotodes minutus, new species

Diagnosis: Apparently smallest known myopsocid, forewings measuring about 2.6 mm in length. All tarsi with t_1 pale and t_2 and t_3 dark brown. Posterior femur creamy yellow except for three dark brown spots on dorsal surface in distal two-thirds. A short spur vein from posterior apex of pterostigma. Vein IA of forewing with scarcely any development of outpocketings.

Male: Measurements:

FW	T	t_1	t_2	t_3	$t_1$ct	IO	D	d	IO/D	PO
2755	945	351	72	77	14	0.21	0.32	0.31	0.66	0.97

Morphology: In forewing a minute spur vein from posterior apex of pterostigma; Rs and M meeting at a point; M touching apex of areola postica at a point. Distal margin of wing evenly rounded, not produced at ends of veins. Anal vein not thrown into bulges.

Terminal abdominal segments: Hypandrium (fig. 105) strongly arched toward middle, apex of arch bearing two macrosetae; strongly sclerotized only around its free margins. Phallosome (fig. 104) an elongate closed frame rounded posteriorly, with narrow notch anteriorly; sides slightly widened for short length distad of middle; along midline sclerotized strip becoming wider and more strongly sclerotized posteriorly, rounded at posterior margin. Clunium with pair of rounded lobes (fig. 106c) dorsally, their surfaces shagreened and bearing a few setae. Epiproct (fig. 106a) truncated distally; shagreened over most of surface and granulate along posterior margin. Paraproct (fig. 106b) terminating in single broad spur; sense cushion with 21–22 trichobothria.

Color (in alcohol): Compound eyes purple. Body extensively creamy yellow and dark brown. Head creamy yellow except dark brown along posterior margin, genae, anterior corners of postclypeus and narrow band along its anterior margin, and a few small spots near ocelli. Antennal scape and pedicel dark brown, flagellum (only two segments present) creamy yellow. Thoracic terga creamy yellow with a few pale brown blotches but anterior face of anteromesial lobe of mesonotum dark brown. Thoracic pleura extensively creamy yellow except for dark brown band running length of thorax above middle. Legs creamy yellow except pale brown partial distal ring on first and second femora, dark brown spot just beyond middle, and dark brown distal ring on each tibia; posterior femur and tarsi as described in diagnosis. Forewing as in figure 103, hindwing as in *P. antillanus.* Color of preclunial abdominal segments poorly preserved, apparently creamy yellow with scattered purplish brown subcuticular pigment. Clunium and hypandrium dark brown. Peri-anal lobes colorless except brown around edges.

Female. Measurements:

	FW	T	t_1	t_2	t_3	$t_1$ct	IO	D	d	IO/D	PO
Dominican Republic	2.58	1.00	0.31	0.06	0.08	14	0.35	0.28	0.25	1.27	0.90
Chiapas, Mexico	3.10	1.15	0.39	0.06	0.08	16	0.41	0.29	0.25	1.45	0.87

Morphology: Forewing as in male except Rs and M fused for a short distance.

Terminal abdominal segments: Subgenital plate (fig. 108) with distal piece broad basally, narrowing abruptly before middle and slender in distal half; bearing four subterminal setae in two ranks of two plus the two terminal macrosetae. Gonapophyses (fig. 107) typical of genus; first and second valvulae exceedingly slender and acuminate; third valvula parallel sided, bearing numerous marginal setae plus scattered setae over outer surface. Epiproct bearing seven long setae near tip plus numerous scattered shorter setae, mostly in distal half. Paraproct with four macrosetae on end of inner lobe; row of setae along ventral margin; sense cushion with 19–21 trichobothria, two central ones with basal florets poorly developed.

Color (in alcohol, Dominican Republic specimen): Similar to male but genae and posterior head margin largely pale brown or creamy yellow; distal brown bands on first and second femora obscure; spots on third femur not so distinct. Antennal flagellum (complete) with faint banding pattern: most of each segment pale brown, its tip colorless.

Specimen from Tabasco, Mexico differing from above in having head marked as in male except a large purplish brown blotch in middle of each parietal area. Preclunial abdominal segments extensively marked with dark purplish brown subcuticular pigment.

Holotype: ♂, Camagüey Prov.: Monte Imías nr. California, June 7, 1959, M.W.S.

Allotype: ♀, Dominican Republic, intercepted at Miami, Florida, July 7, 1964, D. A. Miller.

CUBAN RECORD: Oriente Prov., U. S. Naval Base at Guantánamo Bay, Feb. 8–19, 1965, black light trap, 1 ♂ (paratype).

OTHER RECORDS: Mexico: Chiapas: 16.4 mi. E. Tapanátepec on Hwy. 190, July 12–13, 1962, 2 ♂, 1 ♀, E. L. Mockford et al. Tabasco: 4 mi. W. Frontera, June 26, 1966, on trunks of orange, 1 ♀, E. L. Mockford et al. Veracruz, 5 mi. S. Tecolutla, June 26, 1962, 1 ♂, F. Hill.

Phlotodes antillanus, new species

DIAGNOSIS: All tarsi with t_1 pale except at extreme base, t_2 and t_3 medium brown. All femora brown except for narrow subapical pale ring. A short spur vein from posterior apex of pterostigma. Vein IA of forewing bearing two outpocketings, one subbasal, the other at about distal two-thirds. Forewing margin perceptably protruding at tips of vein M_2 and M_3.

Measurements:

	FW	T	t_1	t_2	t_3	$t_1$ct	IO	D	d	IO/D	PO
Cuba	3.70	1.27	0.45	0.06	0.09	19	0.46	0.31	0.27	1.47	0.85
Dominican Republic	3.29	1.22	0.42	0.06	0.08	18	0.44	0.31	0.25	1.41	0.79
Florida	3.66	1.30	0.44	0.06	0.09	20	0.47	0.31	0.26	1.50	0.82

MORPHOLOGY: In forewing, Rs and M fused a short distance; M connected to areola postica by short crossvein. Distal margin and anal veins of forewing as described in diagnosis.

Terminal abdominal segments—Subgenital plate (fig. 113) with distal piece broad basally, narrowing abruptly before middle and approximately parallel sided from there to tip, bearing in addition to two terminal macrosetae a single and two pairs of smaller subterminal setae, the latter in two ranks of two. Gonapophyses (fig. 111) typical of the genus; first valvula acuminate, short, set at acute angle to its stem; second valvula very slender, curving inward toward tip; third valvula with outer margin slightly bulging toward distal end, valvula beset with several long setae plus a few shorter ones, none marginal. Ninth sternum bearing long, curved sclerite (fig. 112) behind ellipsoidal rim of apparent spermathecal opening. Epiproct bearing four macrosetae in transverse arc before apex; numerous shorter setae scattered over surface. Paraproct with two transverse bands of setae of various lengths converging at end of inner lobe; sense cushion with 22–24 trichobothria.

COLOR (in alcohol): Compound eyes mottled black and gray. Vertex with band of medium brown spots along midline behind ocelli, and along posterior head margin; compound eyes bordered by medium

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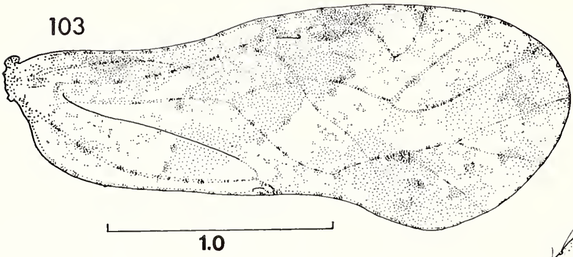

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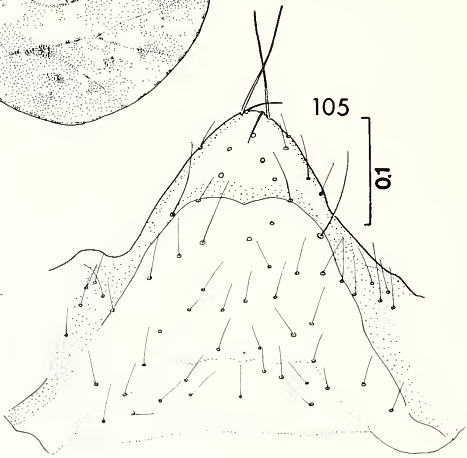

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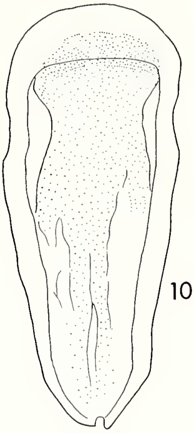

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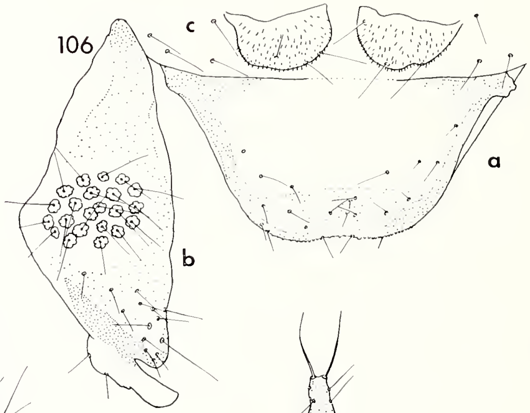

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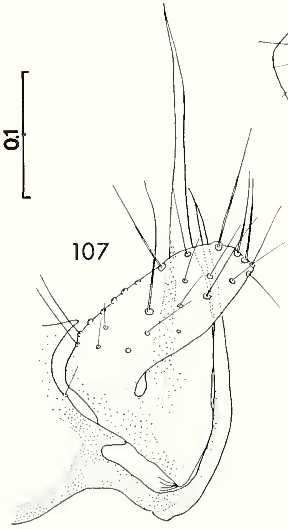

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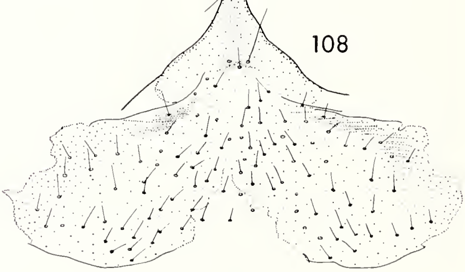

brown spots on inner margins. Labrum, anteclypeus, a small elongated spot anteriorly on postclypeus, most of genae, entire maxillary palpi and antennae medium brown. Remainder of head creamy yellow except faint purple X-shaped mark centered on ocelli, the anterior arms bordering frontal lines. Thorax mottled medium brown and creamy yellow. Each femur medium brown except for pale subterminal ring; likewise each tibia, the ring least distinct on posterior tibia due to paler brown color on each side of it. Base of each t_1 medium brown; remainder yellowish white; each t_2 and t_3 medium brown. Wings as in figure 109, 110. Abdomen entirely yellowish white mottled with purple, except subgenital plate and portions of clunium near attachments of gonapophyses pale brown.

Holotype ♀: Oriente Prov.: Sierra Maestra, Loma del Gato, May 26–28, 1959, M.W.S.

Cuban Records: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 1 ♀ (paratype), M.W.S.

Other Records: Dominican Republic: Dist. Santo Domingo: Santo Domingo, Arroyo Hondo., Jan. 27, 1954, 1 ♀, R. B. Cumming; Boca Chica, Feb. 2, 1954, 4 ♀, E. L. Mockford and R. B. Cumming; Seibo Province: El Seibo, Jan. 8, 1954, 1 ♀, R. B. Cumming.

United States: Florida: Collier Co.: 2 mi. W. Naples Park, Nov. 29, 1970, beating vegetation, 1 ♀, E. L. Mockford; Hendry Co., April 16, 1954, beating large bromeliad on live oak, 1 ♀, E. L. Mockford; Highlands Co., Archbold Biological Station (all records from light trap by S. W. Frost), Nov. 23, 1958, 1 ♀; Dec. 7, 1959, 1 ♀; Feb. 22, 1960, 1 ♀; Pinellas Co., Ozona, Aug. 19, 1970, beating slash pine and oaks, 1 ♀, E. L. Mockford.

Phlotodes cubanus, new species

Diagnosis: Similar to *P. antillanus.* Tarsi and femora same as in that species except subapical pale ring of each femur wider. Pterostigmal spur and outpocketings of vein IA same as in that species. Forewing margin smooth, not protruding at tips of veins M_2 and M_3.

Measurements:

FW	T	t_1	t_2	t_3	$t_1$ct	IO	D	d	IO/D	PO
4.12	1.46	0.47	0.07	0.09	19	0.52	0.36	0.29	1.46	0.79

←

Figs. 103–108. Structures of *Phlotodes minutus*, new species. Fig. 103. ♂ forewing. Fig. 104. ♂ phallosome, scale of Fig. 107. Fig. 105. ♂ hypandrium. Fig. 106a. ♂ Epiproct, b. ♂ paraproct, c. ♂ posterior middorsal region of clunium, scale of Fig. 107. Fig. 107. ♀ Gonapophyses. Fig. 108. ♀ Subgenital plate, half scale of Fig. 107.

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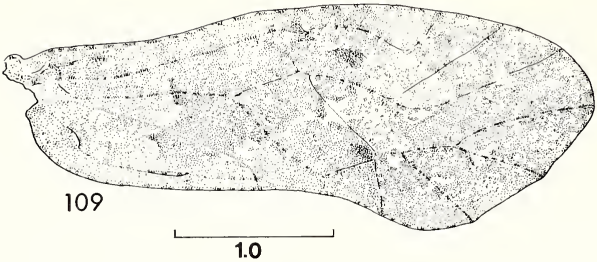

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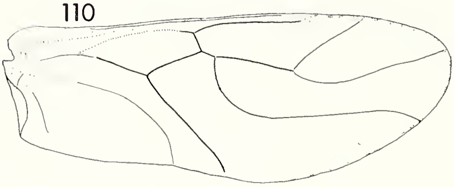

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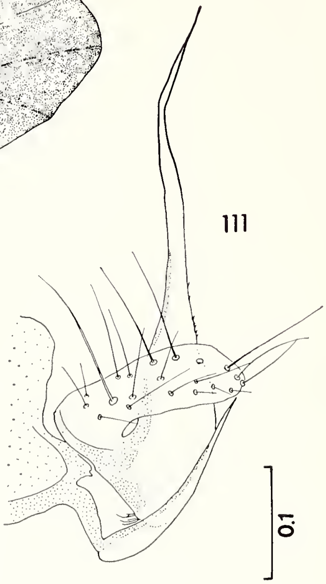

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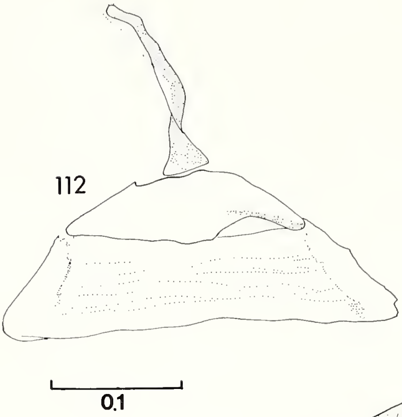

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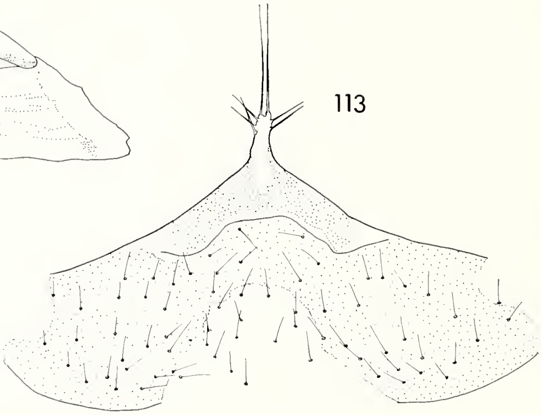


FIGS. 109–113. Structures of *Phlotodes antillanus*, new species ♀. Fig. 109. Forewing. Fig. 110. Hindwing. Fig. 111. Gonapophyses. Fig. 112. Ninth sternum. Fig. 113. Subgenital plate, half scale of Fig. 112.

MORPHOLOGY: In forewing, Rs and M joined at a point; M connected to areola postica by short crossvein. Distal margin and anal vein of forewing as indicated in diagnosis.

Terminal abdominal segments—Subgenital plate (fig. 117) with

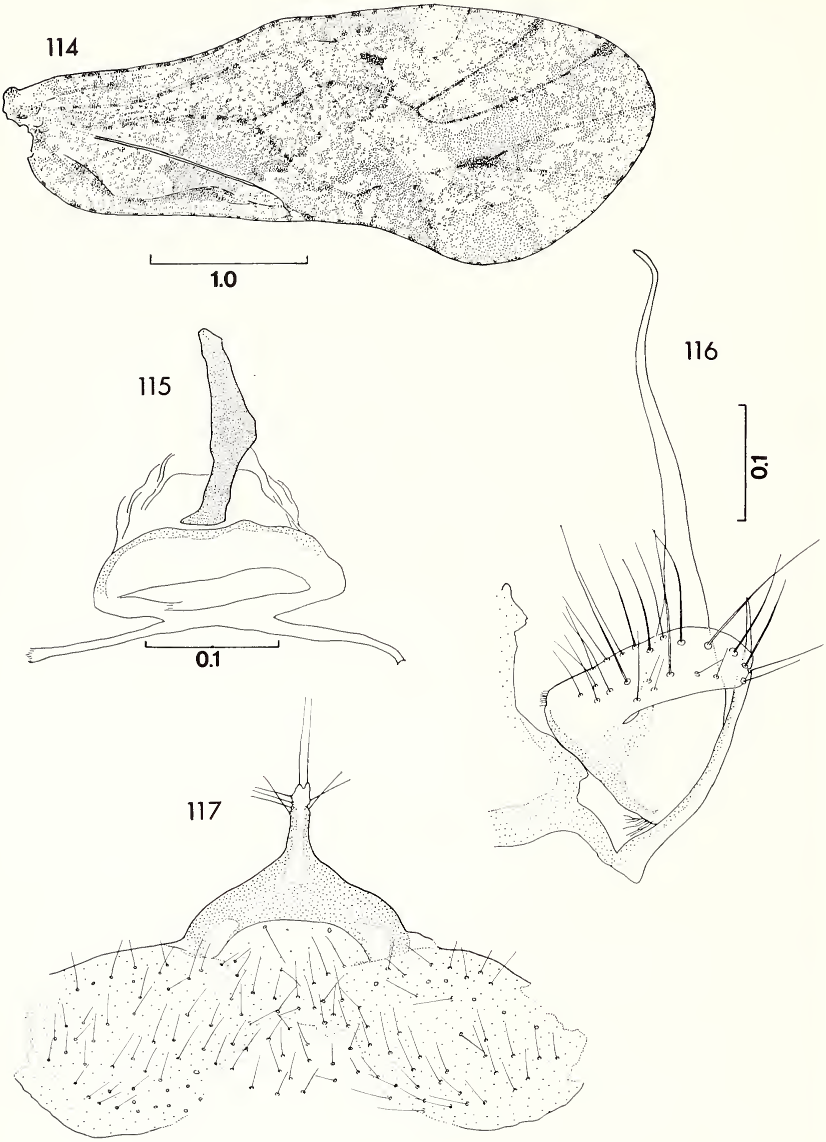
distal piece as described for *P. antillanus* except bearing in addition to the two terminal macrosetae six smaller subterminal setae, four on one side, two on other. Gonapophyses (fig. 116) typical of genus; first valvula acuminate, much longer than in *P. antillanus*, set at approximately right angle to its stem; second valvula very slender; third valvula developed as in *P. antillanus* except outer margin in middle beset with several setae. Ninth sternum bearing long, curved sclerite (fig. 115) decidedly widened in middle behind rim of apparent spermathecal opening; rim bearing anteriorly pair of long, diverging, sclerotized arms. Epiproct as in *P. antillanus*, likewise paraproct except 25–28 trichobothria in sense cushion.

COLOR (in alcohol): Compound eyes purple mottled with darker purple. Head generally creamy yellow liberally marked with irregular purplish brown spots. Prominent spot of this color on gena below each compound eye, on postclypeus at its anterior margin and in middle of each parietal region. Labrum and anteclypeus medium brown. Thorax dorsally mottled creamy yellow and medium brown with purplish brown along sutures. Thoracic pleura mostly creamy yellow mottled with purplish brown, mostly in upper halves. Coxae medium dark brown; all femora same color except for wide subapical pale ring continuing ventrally to tip. All tibiae light brown on basal two thirds darkening from base outward, followed by a dull white ring, followed by a medium dark brown tip. All t_1's brown at base, dull white for remainder; all t_2's and t_3's medium brown. Forewing as in figure 114, hindwing as in *P. antillanus*. Abdominal color poorly preserved.

HOLOTYPE ♀: Las Villas Prov.: Topes de Collantes, Sierra de Trinidad, June 11, 1959, M.W.S.

KEY TO THE GENERA AND SPECIES OF CUBAN MYOPSOCIDAE

1. In hindwings Rs and M joined by crossvein. Female subgenital plate terminating distally in a broadly truncated piece .... *Myopsocus* 2
   In hindwing Rs and M fused for short distance. Female subgenital plate terminating distally in tapering piece bearing two setae on its narrow tip .... *Phlotodes* 3
2. Posterior femur uniformly dark brown .... *M. clypeofasciatus*, new species
   Posterior femur dark brown only in series of spots on its dorsal surface, otherwise pale brown to creamy white .... *M. sparsus* (Hagen) (?)
3. Forewing bearing two distinct outpocketings along vein IA. Posterior femur predominantly brown 4



FIGS. 114–117. Structures of *Phlotodes cubanus*, new species ♀. Fig. 114. Forewing. Fig. 115. Ninth sternum. Fig. 116. Gonapophyses. Fig. 117. Subgenital plate, half scale of Fig. 115.

Outpocketings along vein IA of forewing scarcely discernible. Posterior femur predominantly creamy yellow ..... *P. minutus*, new species

4. Forewing margin protruding at tips of veins M_2 and M_3 .... *P. antillanus*, new species

Forewing margin smooth, not protruding at tips of veins M_2 and M_3 .... *P. cubanus*, new species

FAMILY PSOCIDAE ENDERLEIN

SUBFAMILY CERASTIPSOCINAE BADONNEL

Metylophorus species

A single teneral female is the only representative of this species in the material. It is smaller than any of the species known from the United States and Mexico. The genus has not been recorded previously in the West Indies.

RECORDS: Oriente Prov.: Cupeyal, Yateras, June, 1964, F.Z.

Cerastipsocus cubanus Enderlein

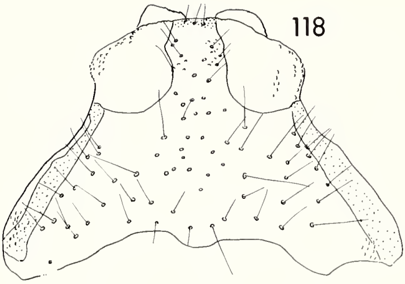
C. cubanus Enderlein, 1919, p. 34.

DIAGNOSIS: A fumose winged species, differing from *C. venosus* (Burmeister) (United States) by having pterostigma deeper and, in male, antennal f_1 somewhat thickened and densely hairy. Differing from *C. sivorii* Ribaga by lack of pale crescent-shaped mark in basal third of forewing. Differing from *C. acraceocristatus* (Enderlein) by lack of pair of elongate processes on distal end of hypandrium. Details of other named fumose winged species not known.

The following description of terminal abdominal structures augments Enderlein's description and measurements.

Male: Hypandrium (fig. 118) symmetrical, its sides strongly sclerotized, the sclerotization ending well before apex; central strongly sclerotized and pigmented band along midline to apex flanked on each side by clear, less sclerotized area bearing lateral granulations; more strongly sclerotized portions of hypandrium beset with setae. Phallosome (fig. 119) a closed frame rounded and bearing small anterior projection basally; near base with small projection on each side; apex granular. Epiproct (fig. 120) pentagonal with base and distal sides long, bearing setae along free edges and across middle. Tip of paraproct as in figure 121.

Female: Subgenital plate (fig. 124) with usual pigment and setal distribution for genus. Gonapophyses as in figure 123. Epiproct (fig. 122) approximately triangular with apex rounded; base colorless (weakly sclerotized) in middle and at sides; colorless oval region in



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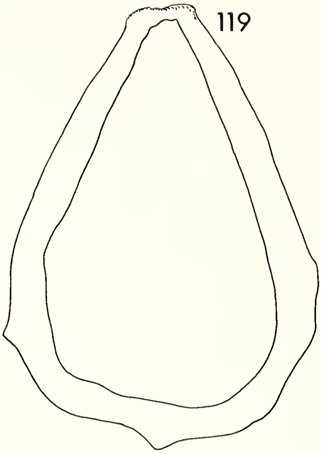

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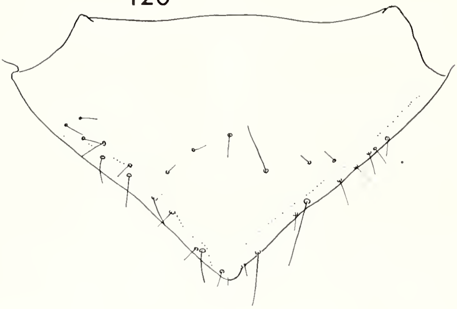

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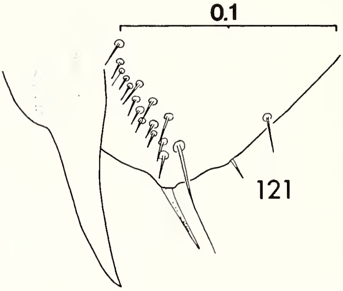

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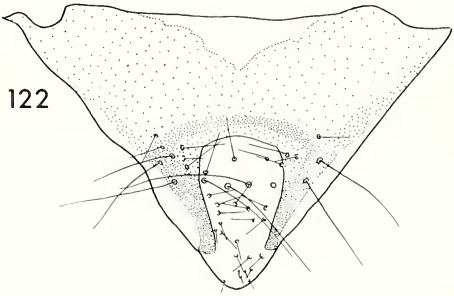

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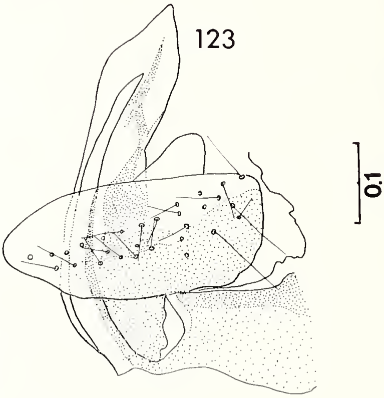

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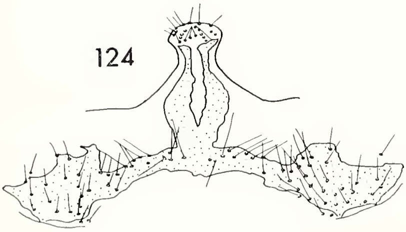

124

apex bordered laterally and anteriorly by strongly sclerotized rim with straight sides; arched row of eight macrosetae across epiproct distad of middle; scattered smaller setae distad of middle.

RECORDS: Las Villas Prov.: Sierra de Trinidad, Topes de Collantes, June 11, 1959, 1 ♀, M.W.S. Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 1 ♀, 8 nymphs, M.W.S.; Gran Piedra nr. Santiago, May 30–31, 1959, 1 ♀, M.W.S.; Loma del Gato, Sierra Maestra, May 26–28, 1959, 13 nymphs, M.W.S.; Turquino, Pico Cuba, Sierra Maestra, June, 1963, 2 ♂, 4 ♀, F. Z. Pinar del Río Prov.: Soroa, Apr., 1964, 1 ♀, F.Z.; July, 1966, 1 ♀, F.Z.

DISCUSSION: Enderlein's description compares the species with its close relative *C. venosus* (Burmeister) and is sufficient to separate the two. Hagen's (1861) record of *C. venosus* from Cuba probably refers to this species.

SUBFAMILY PSOCINAE BADONNEL

Aside from a single species of *Trichadenotecnum* and one of *Ptycta*, all of the Cuban material belongs to a species group currently within *Psocidus* which includes the described North American species *P. bisignatus* (Banks), *P. insulanus* (Chapman), *P. infumatus* (Banks), and *P. texanus* (Aaron). At risk of creating a synonym of the poorly defined genus *Copostigma* Enderlein (including *Clematostigma* Enderlein and *Mecampsis* Enderlein as subgenera according to Roesler, 1944), I am creating a new genus for this species group.

Indiopsocus, new genus

TYPE SPECIES: *Psocus texanus* Aaron.

DIAGNOSIS: Differing from type species of *Psocidus*, *P. zanzibarensis* Pearman, in having phallosome closed anteriorly; hypandrium bearing median sclerotized ridge generally asymmetrical. A pair of rounded sclerites anterior to hypandrium. Differing from other genera of Psocinae in which external genitalic features are known [complex of *Ptycta* Enderlein and *Maheela* Enderlein, *Atlantopsocus* Badonnel,

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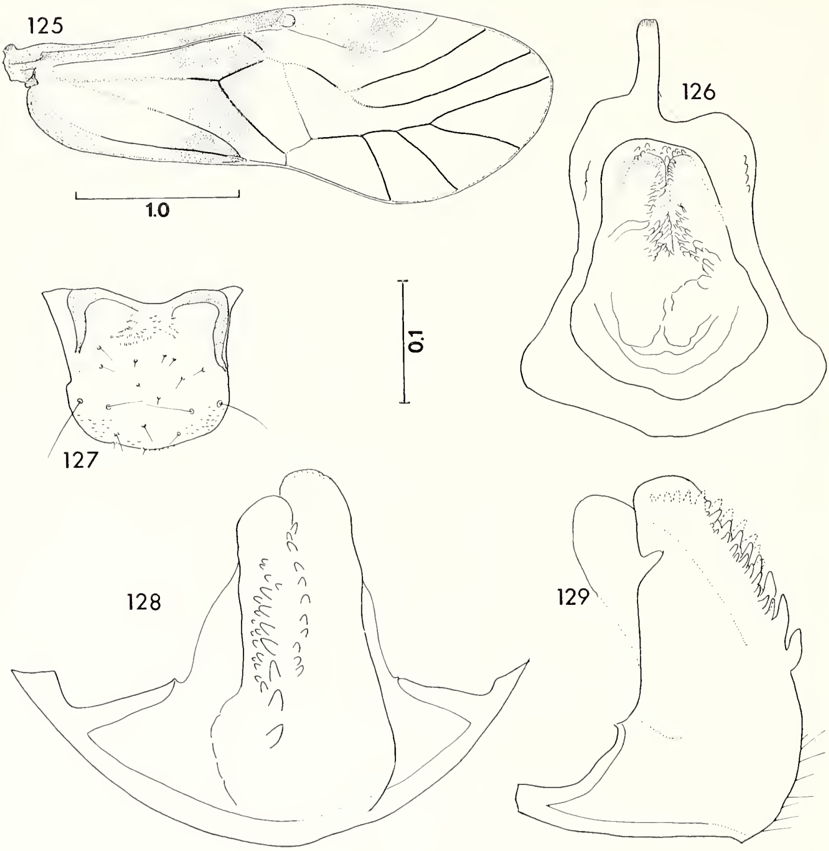
←

FIGS. 118–124. Structures of *Cerastipsocus cubanus* Enderlein. Fig. 118. ♂ hypandrium, scale of Fig. 123. Fig. 119. ♂ phallosome, half scale of Fig. 121. Fig. 120. ♂ epiproct, half scale of Fig. 121. Fig. 121. Distal end of ♂ paraproct. Fig. 122. ♀ epiproct, scale of Fig. 123. Fig. 123. ♀ gonapophyses. Fig. 124. ♀ subgenital plate, half scale of Fig. 123.



Figs. 125–129. Structures of *Indiopsocus cubanus* (Banks) ♂. Fig. 125. Forewing. Fig. 126. Phallosome. Fig. 127. Epiproct. Fig. 128. Hypandrium, ventral view. Fig. 129. Hypandrium, lateral view.

Camelopsocus Mockford, *Hyalopsocus* Roesler, *Oreopsocus* Roesler, *Neopsocus* Kolbe, *Psocus* Latreille (restricted by Pearman, 1932), *Trichadenotecnum* Enderlein] by having phallosome broad basally, at least as broad at base as in middle, generally broader. Differing from *Steleops* Enderlein (including *Pelmatocoria* Enderlein as subgenus according to Roesler, 1944) in absence of any tendency for eyes to be stalked.

Distal process of female subgenital plate always with lateral sclerotization on or near each edge, generally running lengthwise.

Indiopsocus cubanus (Banks), new combination

Psocus cubanus Banks, 1908, p. 257.
Psocidus cubanus (Banks): Smithers, 1967, p. 107.

DIAGNOSIS: Separable from other Cuban species of the genus by characters in key following descriptions.

REDESCRIPTION (based on examination of holotype and two additional specimens):

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
3378	1352	482	174	25	0.28	0.44	0.35	0.63	0.79

MORPHOLOGY: Forewing (fig. 125) with pterostigma of medium depth, bordered by distinct *stigmasaum* from base to posterior apex; Rs and M joined a relatively long distance; Rs fork long, originating basal to M-Cu_{1a} fork; Cu_{1a} before joining median much shorter than segment of the joined veins.

Terminal abdominal segments—Posterior margin of clunium heavily sclerotized before epiproct and paraprocts; this strip widest before paraprocts. Hypandrium (figs. 128, 129) beyond base forming asymmetrical sclerotized strap bilobed at apex, left lobe twisted leftward and bearing lengthwise two rows of elongate teeth, left row irregular and in part flanked by smaller teeth; this row reaching further basad than right, the latter reaching further distad than left. Phallosome (fig. 126) roughly a four sided figure with base broader than apex; corners widened; on apical margin to left of middle a slender, truncated, slightly curved process. Paraproct with field of papillae laterally. Epiproct (fig. 127) approximately quadrate, about half length of paraproct; edges of basal corners heavily sclerotized.

COLOR (in alcohol): Compound eyes purplish gray. Body in general creamy yellow marked with medium brown and purplish brown. Vertex with brown spots along posterior margin, along midline not quite reaching ocelli, also some brown spots bordering compound eyes; frons with brown V-shaped mark extending forward from ocellar interval; each arm of V broadened laterally at about half its length; postclypeus bearing distinct brown striations, these not reaching anterior margin. Antennae (incomplete) medium brown. Thoracic nota and pleura medium brown, paler along sutures. Coxae and tarsi brown; remainder of legs dull white with faintly indicated dusky band around end of each anterior and middle femur. Forewing (fig. 125) with transverse band before middle broad, somewhat broken in radial cell, reaching anterior wing margin only at base of pterostigma. Pterostigma brown only in distal half, the mark not reaching distal end of cell; *stigmasaum* and membrane posterior to it brown only around posterior apex of pterostigma. Cell IA brown in basal third. Remainder of wing clear. Hindwing with faint brown region along anterior margin in middle and another in distal end of cell Cu_2, otherwise clear. Preclunial abdominal segments white, faintly banded with purple. Clunium, epiproct, and paraprocts pale brown; hypandrium and pair of sclerites anterior to it medium brown.

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3397	1351	454	178	22	0.45	0.32	0.23	1.40	0.71

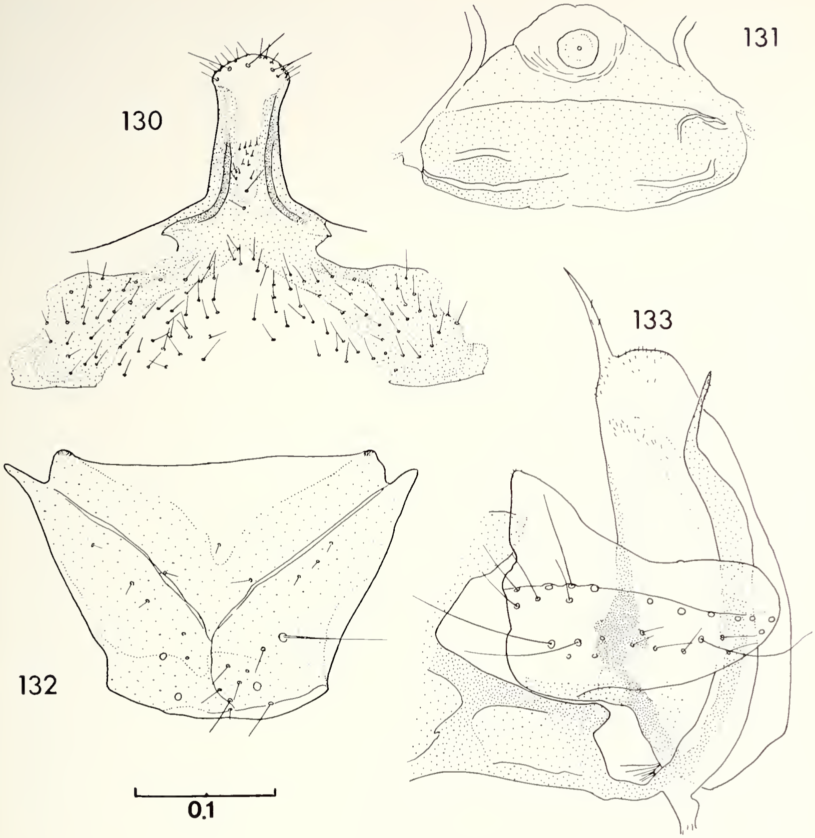
MORPHOLOGY: Forewing much as in male but Rs-M junction somewhat shorter, Rs fork somewhat shorter and about equally distant from wing base as $M\text{-}Cu_{1a}$ fork.

Terminal abdominal segments—Subgenital plate (fig. 130) with distal process slightly expanded laterally at apex and bearing there several setae including three longer than others; heavily sclerotized strip bordering each side of process curving outward and ending to sides of base of process; pigmented basal area forming pair of arms expanded laterally. Gonapophyses (fig. 133): first valvula slender, recurved before apex, recurved portion bearing several minute, backward directed spines; second valvula straight, bearing slender, straight, acuminate process distally and numerous minute spines around base of process; third valvula with row of macrosetae across middle and several setae of various lengths basal to row; distal lobe conical; length from attachment to end of distal lobe less than length across base of valvula. Ninth sternum (fig. 131) bearing transverse elliptical sclerite of ropy texture anterior to spermapore. Paraprocts normal for subfamily; sense cushions each with 26 trichobothria. Epiproct (fig. 132) roughly quadrate with base broader than apex; in distal half, two macrosetae on each side and scattered smaller setae over surface.

COLOR (in alcohol): Generally same as in male, differing in possessing purple spot to each side of V-shaped mark on frons and in having smaller distal brown spot of pterostigma.

RECORDS: Habana Prov.: Habana, holotype ♀, Baker (in Museum of Comparative Zoology, Cambridge, Massachusetts). Oriente Prov.: Cupeyal, Yateras, June, 1965, 1 ♂, 1 ♀, F.Z.

NOTE: The female genitalic figures (figs. 130–133) are based not on the type but on the specimen collected by Zayas. This specimen differs from the type as follows: (1) the distal process of the subgenital plate is slightly longer and more slender; (2) the second valvula is broader at the base of its distal process. Although the possibility of specific distinction is remote, it cannot be dismissed altogether.



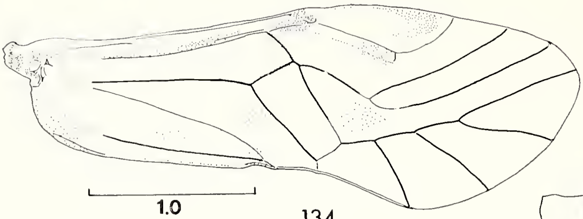
FIGS. 130–133. Structures of *Indiopsocus cubanus* (Banks) ♀. Fig. 130. Subgenital plate, half scale of Fig. 132. Fig. 131. Ninth sternum, scale of Fig. 132. Fig. 132. Epiproct. Fig. 133. Gonapophyses, scale of Fig. 132.

Indiopsocus texanus (Aaron), new combination

Psocus texanus Aaron, 1886, p. 16.
Psocidus texanus (Aaron): Smithers, 1967, p. 111.

DIAGNOSIS: Differing from other Cuban species of genus as indicated in key.

This species was described adequately by Chapman (1930). It occurs around the Gulf Coast of the United States from Texas to



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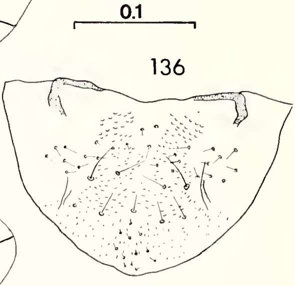

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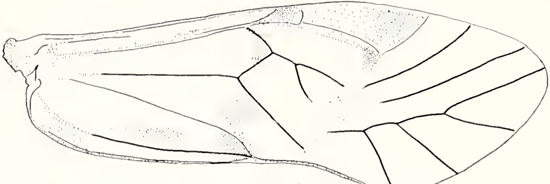

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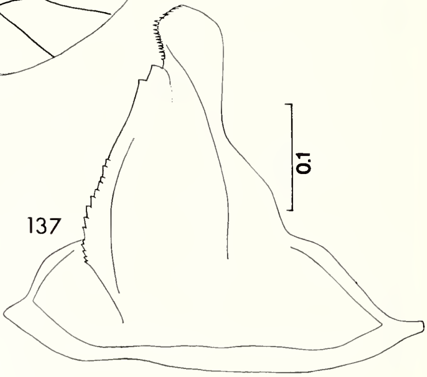

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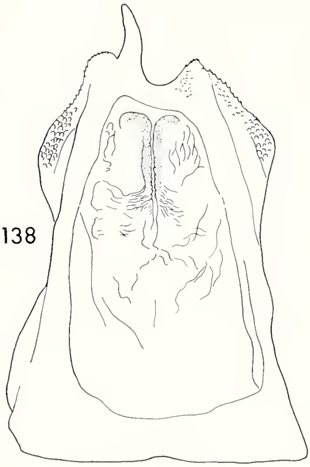

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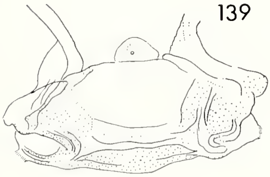

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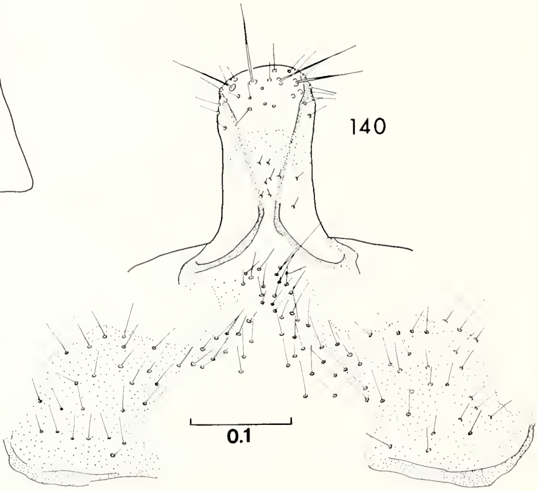

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Florida and up the Atlantic Coast to Long Island. It has not previously been recorded from the West Indies.

RECORDS: Habana Prov.: Jibacoa, March, 1962, 4 ♂, F.Z.; Marianao, Nov., 1966, 3 ♂, 10 ♀, F.Z. Oriente Prov.: Mocambo w. of Imías, June 1, 1959, 1 ♂, M.W.S.

Indiopsocus ubiquitus, new species

DIAGNOSIS: Very similar to *I. texanus* (Aaron), but differing as indicated in key.

Male. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3560	1539	544	176	30	0.28	0.45	0.39	0.61	0.86

MORPHOLOGY: Forewing (fig. 134): pterostigma of medium depth with spur vein from posterior apex and vague *stigmasaum* from base to spur vein. Rs and M fused a short to medium distance. Rs fork long, originating slightly before M-Cu_{1a} fork. Segment of Cu_{1a} before junction with M slightly shorter than joined section.

Terminal abdominal segments—Hypandrium (fig. 137) beyond base broad sclerotized asymmetrical strap bent left at apex; on left side recurved row of short teeth ending after describing arc mesially and back out to side at about three-fourths distance from base to apex; this row paralleled distally by ridge ending on side just distad of tooth row; ridge near right margin running most of length of hypandrium becoming dentate near apex; second ridge median to this one, also dentate near apex. Phallosome (fig. 138) a quadrate frame with base broader than apex; basal corners widened, distal corners enlarged as lateral flanges with surfaces denticulate; curved, acuminate process arising on apex left of middle plane. Paraproct with rough sculpture on side; distal spur short, terminating in slender point. Epiproct (fig. 136) about half length of paraproct, semicircular; at base to each side of midline an angled heavily sclerotized strip; most of surface covered with minute denticles.

COLOR (in alcohol): As described for *I. cubanus* but differing as follows: brown spots along midline of vertex reaching ocellar

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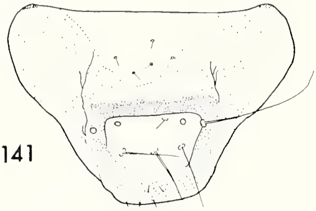
FIGS. 134–140. Structures of *Indiopsocus ubiquitus*, new species. Fig. 134. ♂ forewing. Fig. 135. ♀ forewing. Fig. 136. ♂ epiproct. Fig. 137. ♂ hypandrium, ventral view. Fig. 138. ♂ phallosome, scale of Fig. 136. Fig. 139. ♀ ninth sternum, scale of Fig. 136. Fig. 140. ♀ subgenital plate.



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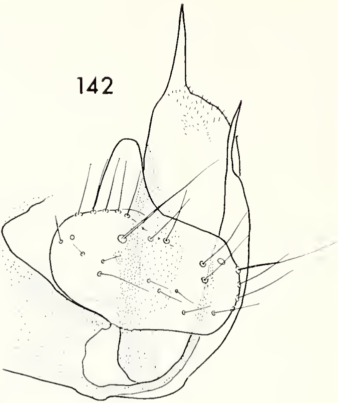

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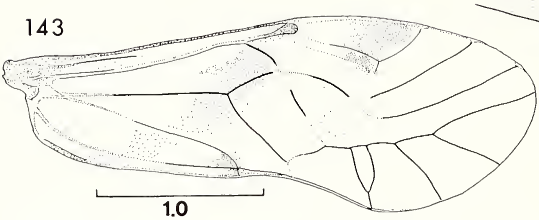

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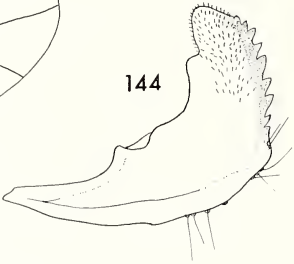

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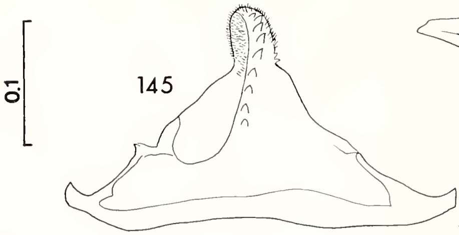

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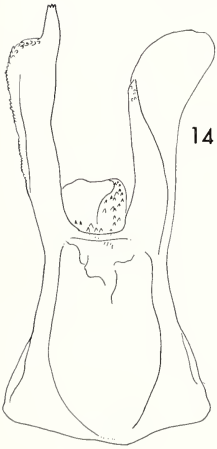

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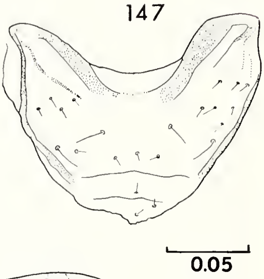

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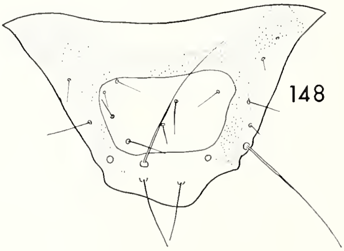

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interval and forming brown ring around it. Dusky bands around femora subterminal and present on each femur. Tibiae white. Forewing (fig. 134) with transverse brown band before middle restricted to borders of veins plus spot in cell Cu_{1b} and nodular spot in cells Cu_2 and IA. In cell Cu_2 another spot just distad of middle.

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3357	1377	485	166	27	0.41	0.29	0.22	1.41	0.75

MORPHOLOGY: Forewing as in male.

Terminal abdominal segments—Subgenital plate (fig. 140) having distal process beset at tip with numerous short setae and four longer ones; pair of slender sclerotized strips traversing process, broken in middle, converging toward base of process then curving outward and terminating to sides of base of process; pigmented basal area of plate forming pair of curved arms expanded laterally. Gonapophyses (fig. 142) as described for *I. cubanus* but first valvula somewhat widened in middle. Ninth sternum (fig. 139) with round spot at spermapore and some sinuous sclerotizations anterior to it. Paraprocts normal for subfamily; sense cushions with 20–21 trichobothria. Epiproct (fig. 141) truncate apically, base much broader than apex; quadrate region outlined in heavy sclerotization set in distal half and including two transverse rows of macrosetae, three in more basal, four in more distal row.

COLOR (in alcohol): Same as in male, but transverse band of forewing (fig. 135) better developed.

HOLOTYPE ♂, allotype ♀, 4 ♂ and 2 ♀ paratypes: Oriente Prov.: Gran Piedra nr. Santiago, May 30–31, 1959, M.W.S.

PARATYPES: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 3 ♂; Loma del Gato, Sierra Maestra, May 26–28, 1959, 2 ♂, 6 ♀; n. of Sabanilla, June 2, 1959, 1 ♂, M.W.S.; Palma Sola, Sierra Maestra, June, 1965, 1 ♂, F.Z.

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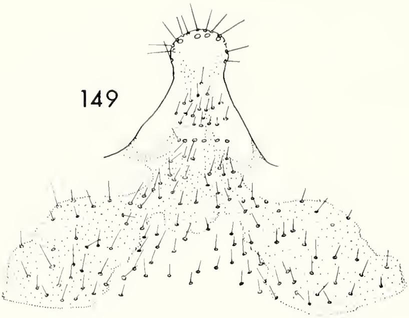
FIGS. 141–148. Structures of Cuban *Indiopsocus*. Fig. 141. *I. ubiquitus*, new species ♀, epiproct, scale of Fig. 145. Fig. 142. *I. ubiquitus*, new species ♀, gonapophyses, scale of Fig. 145. Figs. 143–148. *I. affinis*, new species. Fig. 143. ♀ Forewing. Fig. 144. ♂ hypandrium, lateral view, scale of Fig. 145. Fig. 145. ♂ hypandrium, ventral view. Fig. 146. ♂ phallosome, scale of Fig. 145. Fig. 147. ♂ epiproct. Fig. 148. ♀ epiproct, scale of Fig. 145.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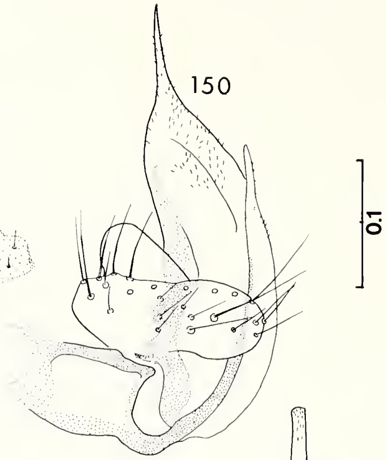
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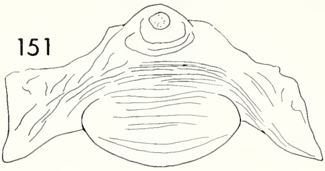
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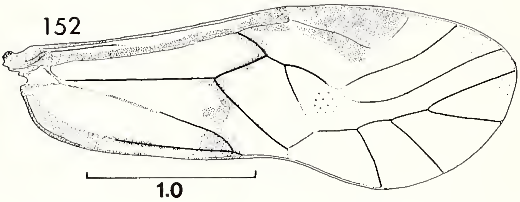
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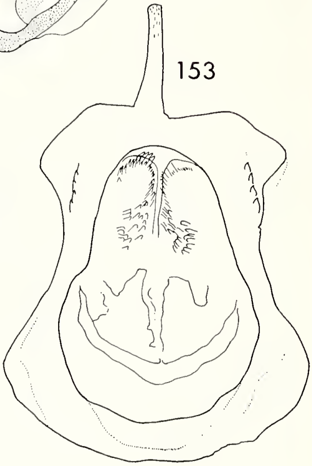
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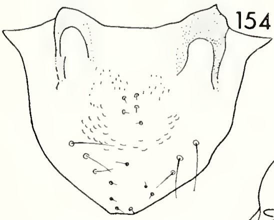
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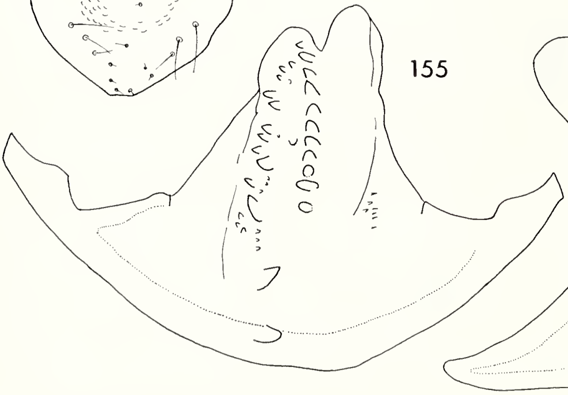
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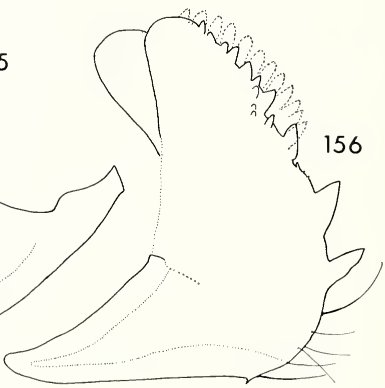
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Indiopsocus affinis, new species

DIAGNOSIS: Differing from other Cuban species of the genus by characters in key. Very similar to *I. insulanus* (Chapman), but differing in details of hypandrium and phallosome.

Male. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
—	1100	405	131	20	0.26	0.34	0.29	0.76	0.84

MORPHOLOGY: Forewing represented by fragment. Rs and M fused a short distance; *stigmasaum* present from base of pterostigma presumably to posterior apex.

Terminal abdominal segments—Posterior margin of clunium heavily sclerotized on each side of middle before base of paraproct and lateral corner of epiproct. Hypandrium (figs. 144, 145) triangular, bearing longitudinal row of 11 teeth on ridge up middle to apex of triangle; surface well sclerotized to right of ridge, weakly sclerotized to left; apex of triangle densely beset with minute spines and denticles to about half-way down row of teeth. Phallosome (fig. 146) a four sided figure broader basally than distally; margin expanded at basal corners and very weak in middle at base; at each distal corner bearing posteriorly directed process, left one sharply constricting near apex to terminate as blunted point; right one thumb-shaped and bearing diagonal ridge on upper surface; outer margin of left process and ridge of right process denticulate. Paraproct with distal spur elongate, curved, acuminate-tipped. Epiproct (fig. 147) about half length of paraproct, dome-shaped, bearing heavily sclerotized arch in basal half; sides of arch at base extending laterally to lateral margins.

COLOR: Specimen not in suitable condition for color determination; color apparently similar to that of female.

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3197	1216	414	137	19	0.37	0.26	0.19	1.43	0.75

←

FIGS. 149–156. Structures of Cuban *Indiopsocus*. Figs. 149–151. *I. affinis*, new species ♀. Fig. 149. Subgenital plate, half scale of Fig. 150. Fig. 150. Gonapophyses. Fig. 151. Ninth sternum, scale of Fig. 150. Figs. 152–156. *I. camagueyensis*, new species ♂. Fig. 152. Forewing. Fig. 153. Phallosome, scale of Fig. 150. Fig. 154. Epiproct, scale of Fig. 150. Fig. 155. Hypandrium, ventral view, scale of Fig. 150. Fig. 156. Hypandrium, lateral view, scale of Fig. 150.

Morphology: Forewing (fig. 143) with a long spur vein from posterior apex of pterostigma; *stigmasaum* present from base of pterostigma to spur vein; Rs and M joined a very short distance; segment of Cu_{1a} from fork with Cu_{1b} to junction with M slightly shorter than joined veins; Rs fork long, originating before M-Cu_{1a} fork.

Terminal abdominal segments—Subgenital plate (fig. 149) with distal process slightly expanded and rounded apically, bearing numerous setae on its distal edge; at base of process a weakly defined curved sclerotized band running from near middle of each lateral margin of process; basal pigmented area two curved arms expanded as large quadrate areas anterolaterally. Gonapophyses (fig. 150): first valvula somewhat widened near basal stem, acuminate apically with numerous minute backward directed spines on narrow apical part; second valvula tapering slightly to abruptly narrowed terminal process; process and distal third of valvula bearing minute spines; third valvula with short distal lobe; several scattered setae on basal lobe, including some on its distal margin. Ninth sternum (fig. 151) with transverse oval sclerite anterior to spermapore. Paraproct normal for subfamily, with 19–20 trichobothria on sense cushion. Epiproct (fig. 148) roughly triangular with quadrate region set off by heavily sclerotized margin in distal two-thirds; seven macrosetae and a few shorter setae in or on edges of quadrate region.

Color (in alcohol): Compound eyes black. Body in general creamy yellow marked with medium brown, as in *I. cubanus*, differing as follows: thoracic notal lobes brown with broad creamy borders and creamy midline; dusky band at apex of each femur most prominent on posterior femur; in forewing (fig. 143) transverse band before middle of wing broad but broken just before M-Cu_1 fork and again just before vein Cu_2; spot in cell Cu_2 just beyond half its length in addition to distal spot; faint spot in cell R_5 near its base.

Holotype ♀ And 1 ♀ Paratype: Oriente Prov.: Loma del Gato, Sierra Maestra, May 26–28, 1959, M.W.S.

Allotype: Oriente Prov.: Gran Piedra nr. Santiago, May 30–31, 1959, M.W.S.

Paratypes: Oriente Prov., La Siberia, Sierra Maestra, June, 1967, 1 ♀, F.Z. Cuba: no date, 1 ♀, F.Z.

Note: The female of *I. insulanus* remains undescribed. For the purpose of comparison with *I. affinis*, it may be characterized briefly as follows: (1) a minute spur vein extends from the posterior apex of the pterostigma; (2) the subgenital plate has lateral pigmented arms that are relatively wide and reinforced underneath by two oval areas of fibrous-appearing thickenings; (3) the distal process of the subgenital plate has the margins heavily sclerotized laterally at the base of the process, the process lacking a pair of sclerotized curved bands running out to the lateral margins at base; (4) the sclerite of the ninth sternum is concave posteriorly. Comparison with the description of *I. affinis* shows differences in all of these characters.

Indiopsocus camagueyensis, new species

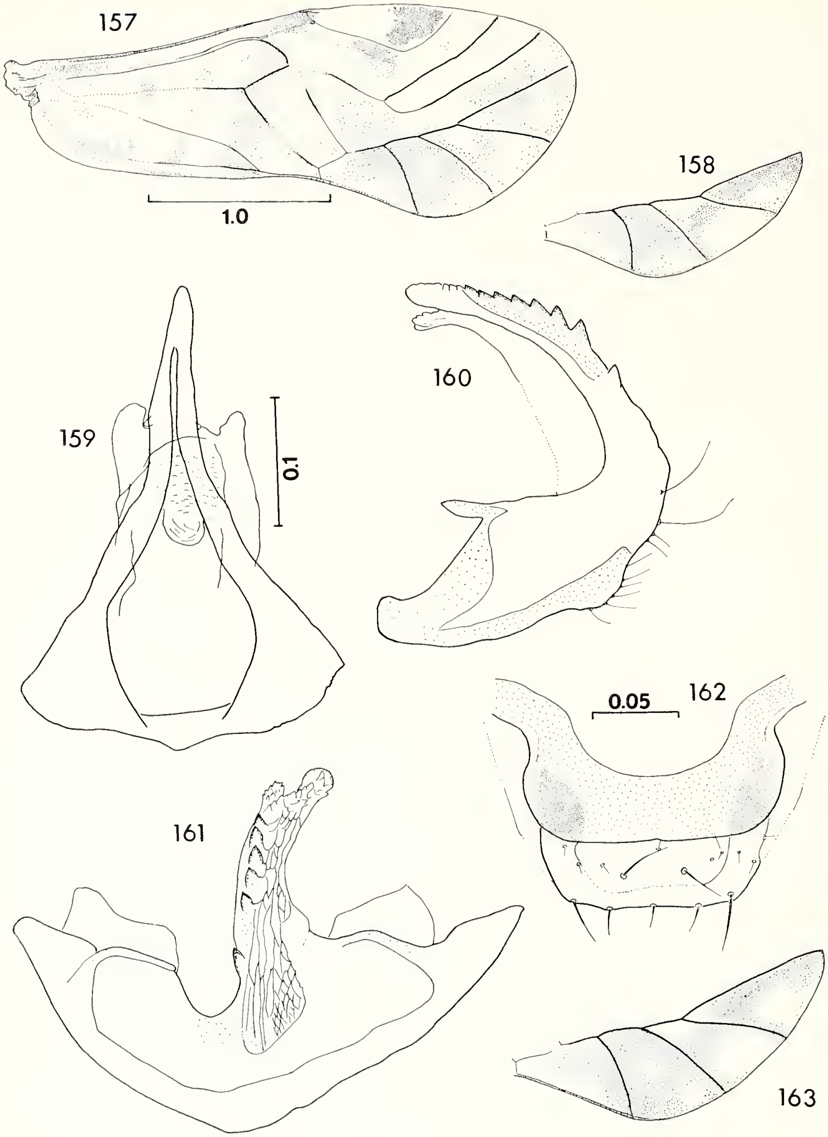
DIAGNOSIS: Very similar to *I. cubanus*, but differing as indicated in key.

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
2990	1265	424	138	25	0.29	0.34	0.31	0.84	0.92

MORPHOLOGY: Forewing as described for *I. cubanus*. Terminal abdominal segments—Posterior margin of clunium heavily sclerotized before epiproct and paraprocts, this sclerotized strip much wider than in *I. cubanus* and shallowly but distinctly trilobed on its posterior margin at sites of epiproct and paraprocts. Hypandrium (figs. 155, 156) beyond base forming asymmetrical sclerotized strap and bilobed at apex, left lobe slightly twisted leftward and bearing two longitudinal rows of elongate teeth; left row irregular, in part double, reaching close to base of hypandrium, with basal two teeth very large; right row more regular, extending from apex less than half length of hypandrium, but extending farther apically than left row. Phallosome (fig. 153) roughly a four-sided figure with base somewhat broader than apex; all corners expanded, distal ones more than basals; near distal corner on each side a longitudinal row of four appressed teeth; elongate process, nearly straight, truncated apically arising from distal margin just left of midline. Paraproct with scale-like sculpture laterally; short, rough surfaced process arising from middle of sense cushion. Epiproct (fig. 154) rounded apically; bearing a J-shaped heavy sclerotization at base on each side.

COLOR (in alcohol): Compound eyes dark purple. Body creamy yellow marked with medium brown, markings differing from those described for *I. cubanus* as follows: brown markings of vertex more extensive and solid rather than spotted; those along midline reaching ocelli and continuing around ocellar interval, joining laterally with brown borders of compound eyes, thus isolating creamy yellow patch in each parietal region. Front tibiae medium brown, other tibiae paler. Dusky bands on femora subterminal and present on all femora. In forewing (fig. 152) entire pterostigma brown except for narrow basal region; *stigmasaum* entirely brown, this mark extending back to origin



FIGS. 157–163. Structures of Cuban *Indiopsocus*. Figs. 157–162. *I. variegatus*, new species. Fig. 157. ♂ forewing. Fig. 158. ♀ median region of forewing, scale of Fig. 157. Fig. 159. ♂ phallosome. Fig. 160. ♂ hypandrium, lateral view, scale of Fig. 159. Fig. 161. ♂ hypandrium, ventral view, scale of Fig. 159. Fig. 162. ♂ epiproct and adjacent region of clunium. Fig. 163. *I. dentatus*, new species ♂, median region of forewing, scale of Fig. 157.

of R_1; transverse band before middle of wing restricted to edges of veins, spot in cell Cu_1, and spot at end of cells Cu_2 and IA; cell IA dark in basal half.

HOLOTYPE ♂: Camagüey Prov.: Monte Imías nr. California, June 7, 1959, M.W.S.

Indiopsocus variegatus, new species

DIAGNOSIS: Forewing extensively marked with brown, including transverse band before middle, spots near base, in middle, and in end of cell Cu_2 (subbasal and end spots extending into cell IA), spot in distal half of pterostigma and distally in *stigmasaum*, but also distinct spot in cell R_5 near base and irregular submarginal band through cells R_5, M_1, M_2, M_3, and Cu_{1a}, filling almost completely latter two cells.

Male. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3147	1251	430	143	22	0.20	0.38	0.29	0.54	0.76

MORPHOLOGY: Forewing (fig. 157) with pterostigma of moderate depth and lacking spur vein; *stigmasaum* from base to posterior apex of pterostigma; Rs and M fused moderate distance; free basal portion of Cu_{1a} only slightly shorter than M-Cu_{1a} fusion, the two vein segments forming nearly straight line.

Terminal abdominal segments—Clunium in middle extending as quadrate shelf over base of epiproct (fig. 162); posterior margin of clunium on shelf and on each side of it beyond paraproct base heavily sclerotized and demarcated by precise line. Hypandrium (figs. 160, 161) beyond base narrow heavily sclerotized nearly symmetrical strap bifid apically and bearing on its median ridge row of teeth becoming much smaller apically and continuing out right lobe of bifid apex; strap to sides of teeth heavily sculptured with reticulate areoles. Phallosome (fig. 159) tapering from broad base to narrow distal apex; sides broad at base; about two-thirds distance from base to tip a pair of membranous lateral expansions slightly sclerotized basolaterally (apparently homologs of sclerotized distal expansions of other species of the genus). Paraproct with lateral heavily sclerotized strip from base to sense cushion; distal prong acuminate apically. Epiproct (fig. 162) quadrate, heavily sclerotized at sides in basal half, bearing row of five setae on posterior margin and two long setae before row.

COLOR (in alcohol): Compound eye color deteriorated; remaining body colors as described for *I. cubanus* except dusky femoral rings submarginal, pronounced, and on each femur. Forewing as described in diagnosis. Hindwing unmarked.

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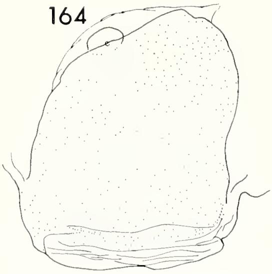

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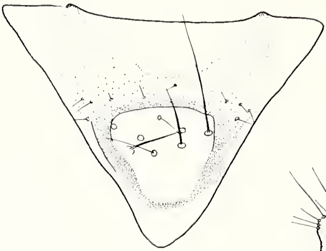

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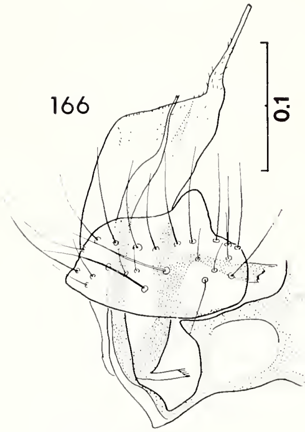

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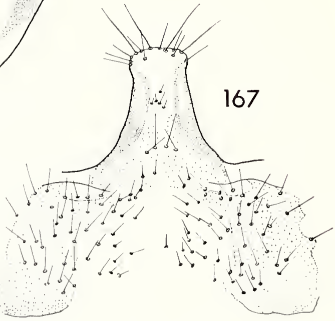

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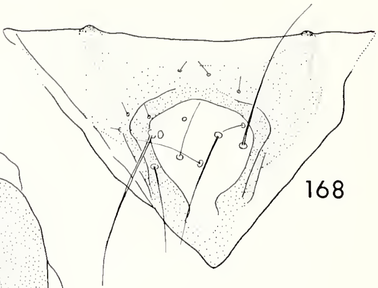

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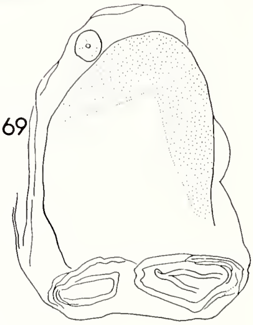

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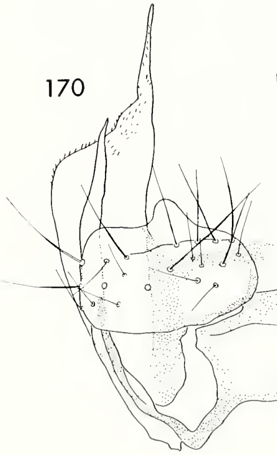

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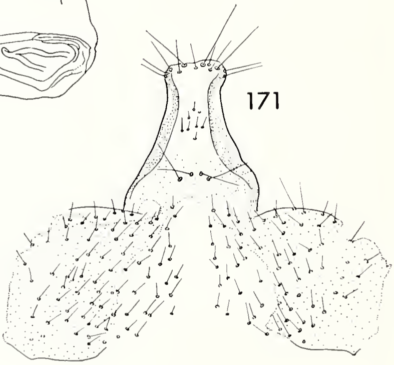

Female. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
2997	1146	391	144	24	0.36	0.25	0.20	1.44	0.81

MORPHOLOGY: Forewing as in male except Rs and M joined at a point.

Terminal abdominal segments—Subgenital plate (fig. 167) with tip slightly expanded and beset with four long setae and several shorter ones; about two-thirds distance from base to tip a group of five small setae; about one-third distance from base to tip a transverse row of four normal setae; process with sclerotized line on each side curving inward from lateral margin at tip, paralleling edge to base, and curving out to near margin at base; basal pigmented area a pair of tenous arms each terminating anterolaterally as a large quadrate area. Gonapophyses (fig. 166) with first valvula sinuously curved from its stem, recurved and exceedingly slender apically; second valvula broad to near tip, rapidly constricting to base of straight apical process; third valvula with short distal lobe; basal lobe with distinct transverse row of setae and numerous setae of different sizes basad of row; inner margin of basal lobe forming small rounded process. Ninth sternum (fig. 164) bearing thick plate before spermapore, plate straight anteriorly and asymmetrically rounded posteriorly. Epiproct (fig. 165) dome-shaped, bearing in distal half a dome-shaped region enclosed anteriorly and laterally by heavily sclerotized edge; this region including several long setae. Paraproct normal for subfamily; sense cushion with 14–15 trichobothria.

COLOR (in alcohol): As described for male except for slight differences in median area of forewing (fig. 158).

HOLOTYPE ♂: Oriente Prov.: Gran Piedra nr. Santiago, May 30–31, 1959, M.W.S.

ALLOTYPE ♀ AND 1 ♀ PARATYPE: Oriente Prov.: Loma del Gato, Sierra Maestra, May 26–28, 1959, M.W.S.

PARATYPES: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, 2 ♀, M.W.S.

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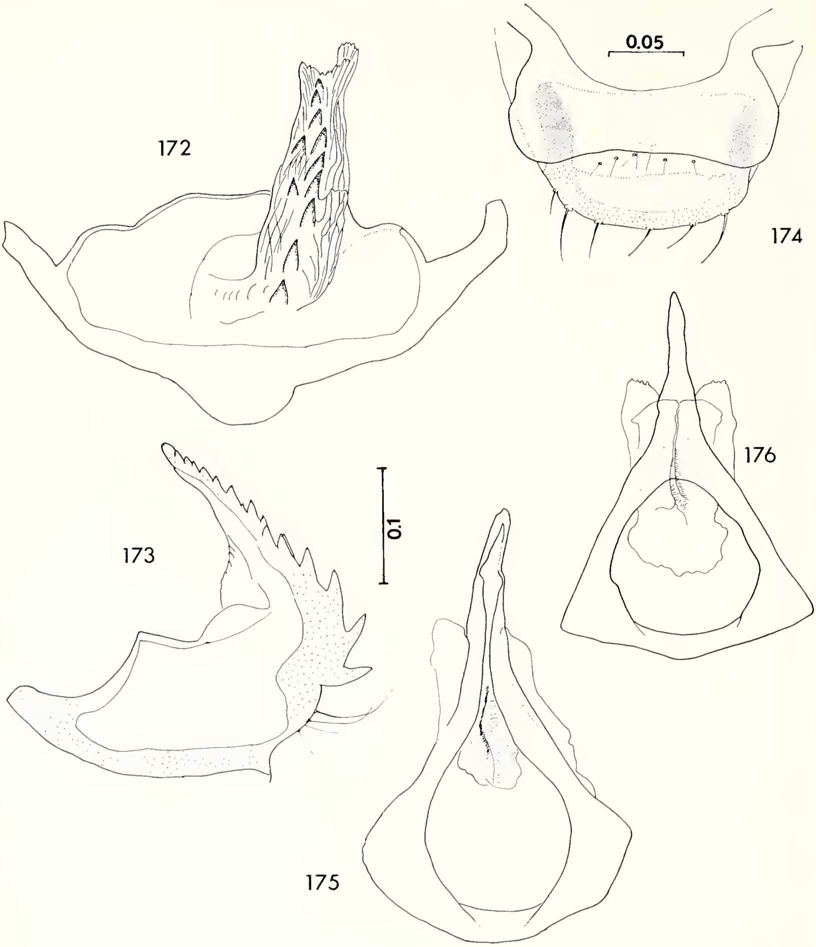
FIGS. 164–171. Structures of Cuban *Indiopsocus*. Figs. 164–167. *I. variegatus*, new species ♀. Fig. 164. Ninth sternum, scale of Fig. 166. Fig. 165. Epiproct, scale of Fig. 166. Fig. 166. Gonapophyses. Fig. 167. Subgenital plate, half scale of Fig. 166. Figs. 168–171. *I. dentatus*, new species ♀. Fig. 168. Epiproct, scale of Fig. 166. Fig. 169. Ninth sternum, scale of Fig. 166. Fig. 170. Gonapophyses, scale of Fig. 166. Fig. 171. Subgenital plate, half scale of Fig. 166.



FIGS. 172–176. Structures of Cuban *Indiopsocus*. Figs. 172–175. *I. dentatus*, new species ♂. Fig. 172. Hypandrium, ventral view, to lower scale. Fig. 173. Hypandrium, lateral view. Fig. 174. Epiproct and adjacent region of clunium. Fig. 175. Phallosome. Fig. 176. *I. microvariegatus*, new species ♂, phallosome, to lower scale.

Indiopsocus dentatus, new species

DIAGNOSIS: Forewings marked almost exactly as in *I. variegatus*, differing primarily in having submarginal brown band much more strongly developed in cell M_1 and M_2 and with distinct colorless spot in middle of band in cell M_3. Male hypandrium with very large basal teeth on ridge; these absent in *I. variegatus*.

Male. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3526	1325	448	150	24	0.24	0.40	0.32	0.60	0.81

MORPHOLOGY: Forewing (fig. 163) as described for *I. variegatus* except free basal portion of Cu_{1a} equal in length to M-Cu_{1a} fusion.

Terminal abdominal segments—Clunium with shelf over base of epiproct (fig. 174); sides of shelf convex and its posterior margin decidedly concave. Hypandrium (figs. 172, 173) as in *I. camagueyensis* but differing as described in diagnosis. Phallosome (fig. 175) as in *I. variegatus* but membranous lateral expansions not sclerotized basolaterally. Epiproct and paraproct as described for *I. variegatus.*

COLOR (in alcohol): Compound eyes black. Two median postclypeal striations heavier than others; all postclypeal striations darkest across middle, thus forming vague cross on postclypeus. Femoral rings distinct, subapical, brown, on all femora. Otherwise as described for *I. variegatus*, differing only in details of distal band of forewing (fig. 163).

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3406	1257	431	157	22	0.40	0.27	0.18	1.48	0.69

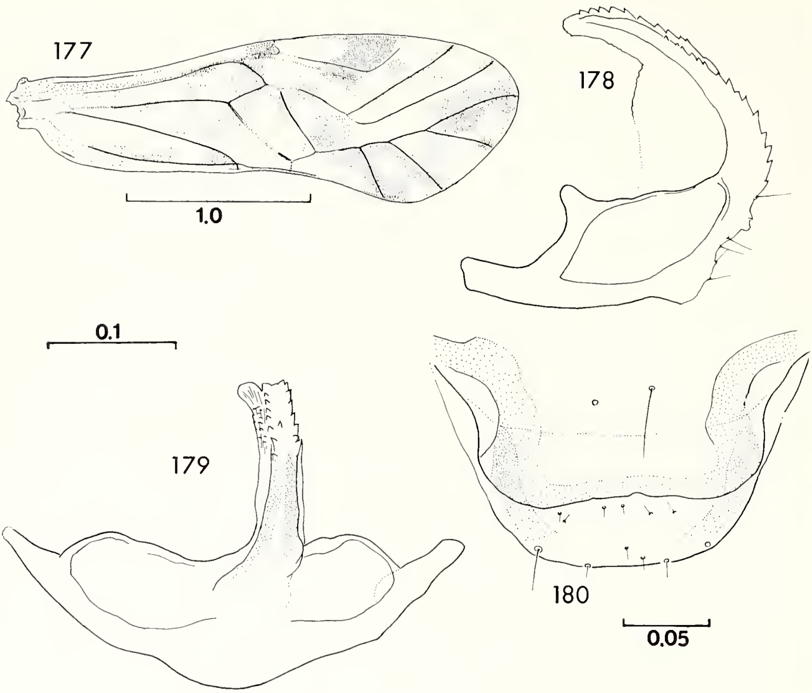
MORPHOLOGY: Almost exactly as described for *I. variegatus*, differing as follows: in forewing Rs and M joined short distance; in subgenital plate (fig. 171), eight short setae in field on distal process at two-thirds distance from base to tip; quadrate anterolateral pigmented areas of plate decidedly emarginate posterolaterally; third valvula of gonapophyses (fig. 170) with exceedingly short distal lobe; sclerite of ninth sternum (fig. 169) not so asymmetrical; sense cushions of paraprocts each with 18 trichobothria. Epiproct as in figure 168.

COLOR (in alcohol): As in male except postclypeal striations not reaching posterior clypeal margin except for one middle striation extending as series of spots to margin; hence cross, though more vague than in male, present on postclypeus.

HOLOTYPE ♂ AND ALLOTYPE ♀: Oriente Prov., Gran Piedra, June, 1967, F.Z.

Indiopsocus microvariegatus, new species

DIAGNOSIS: Forewing (fig. 177) marked almost exactly as in *I. variegatus*, but differing in details of submarginal brown band,



FIGS. 177–180. Structures of *Indiopsocus microvariegatus*, new species ♂. Fig. 177, Forewing. Fig. 178. Hypandrium, lateral view, scale of Fig. 179. Fig. 179. Hypandrium, ventral view. Fig. 180. Epiproct and adjacent region of clunium.

especially brown region in cell M_3 developed as narrow border around large central pale spot; brown regions of band in cell R_5 and M_1 strongly pigmented. Clunial shelf over epiproct concave posteriorly and with angular sides.

Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
2718	1157	408	134	22	0.19	0.32	0.27	0.60	0.86

MORPHOLOGY: Forewing as described for *I. variegatus* except free basal portion of Cu_{1a} decidedly shorter than M-Cu_{1a} fusion, and these two vein segments set at distinct, though slight, angle to each other.

Terminal abdominal segments—Clunium with shelf over epiproct (fig. 180); posterior margin of shelf concave; region bordering posterior margin not demarcated by line from remainder of shelf. Hypandrium (figs. 172, 173) developed as in *I. variegatus* but with two rows of teeth on strap, left-hand row reaching much closer to base of strap than right. Phallosome (fig. 176) and paraproct as in *I. variegatus.* Epiproct approximately semicircular, heavily sclerotized on sides, with setae distributed as in *I. variegatus* (fig. 180).

COLOR (in alcohol): As described for *I. variegatus*, differing as noted in diagnosis and as follows. Purplish brown pigmentation of preclunial abdominal segments mostly confined to sides of segments. Postclypeal striations with middle pair of striae joined to form broad middle band further emphasized by darker line down its center.

HOLOTYPE ♂: Pinar del Río Prov.: Soroa, April, 1967, F.Z.

Indiopsocus pallidus, new species

DIAGNOSIS: Separable from other Cuban species by characters in key.

Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3329	1369	464	153	22	0.43	0.33	0.22	1.31	0.67

MORPHOLOGY: Forewing (fig. 181) with pterostigma of moderate depth with short spur vein from posterior apex; Rs and M fused moderate distance; Rs fork long, originating basal to M-Cu_{1a} fork. Free portion of Cu_{1a} very slightly shorter than M-Cu_{1a} fusion.

Terminal abdominal segments—Subgenital plate (fig. 185) with distal process truncated at apex and bearing there four long setae and several shorter ones; sclerotized strip on each side at apex directed basomesially and quickly dissipating; basal pigmented region of plate a pair of slender arms curving laterally and each terminating anterolaterally in quadrate area. Gonapophyses (fig. 184): first valvula slender, curved, with acuminate tip; knob developed at junction of valvula with its stem; second valvula broad, tapering abruptly to acuminate tip, beset with numerous minute spines distally; third valvula with small distal lobe, scattered setae of various lengths on basal lobe. Ninth sternum with a ropy appearing sclerotized region at base of each set of gonapophyses, the two connected by transverse region of similar texture (fig. 183). Paraprocts normal for subfamily; sense cushions with 17–19 trichobothria. Epiproct (fig. 182) triangular, bearing distally a quadrate region outlined by heavily sclerotized rim and including seven long setae.

COLOR (in alcohol): Compound eyes and ocellar interval black. Body in general creamy yellow and medium brown, brown areas much

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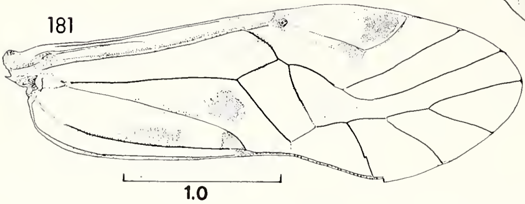

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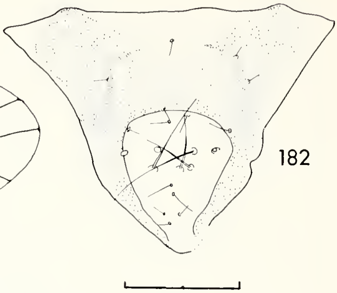

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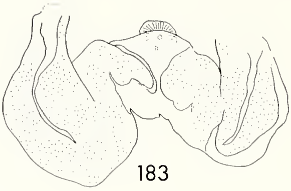

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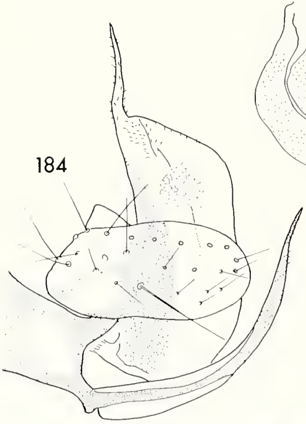

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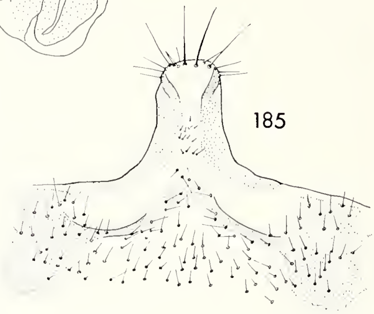

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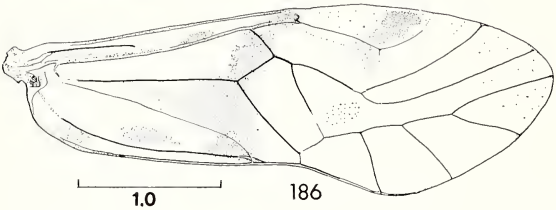

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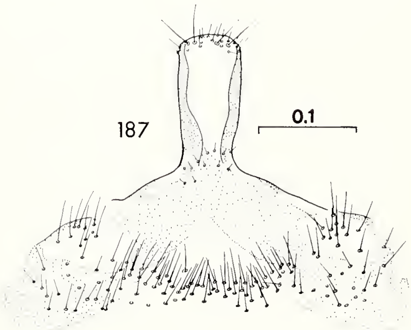

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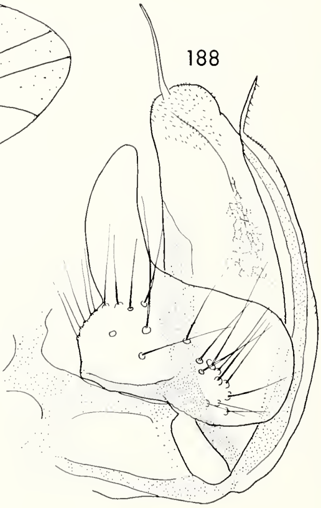

restricted. Vertex creamy yellow with a few vague purplish brown flecks; a purplish brown spot to each side of ocellar interval; dark brown stripe along each frontal line; frons with usual V-shaped mark in middle and dark brown spot to each side of it; postclypeal striations reduced to rows of spots in transverse band across middle of postclypeus plus middle two striations running as rows of spots the length of sclerite. Pterothoracic terga with medium brown spot on each lobe, spots broadly bordered with creamy yellow. Thoracic pleura largely creamy yellow; anterior coxae likewise; middle and posterior coxae medium brown basally, white distally. Femora and tibiae white but each femur with subapical brown band, band broken dorsally; anterior and middle coxae medium brown, paler posteriorly; posterior first tarsal segment white, second medium brown. Forewing (fig. 181) with transverse brown band before middle represented only by spot at base of pterostigma, narrow border at basal segment of Rs, spot in cell Cu_{1b} and distal spot in cell Cu_2; middle spot present in latter cell; distal spot of pterostigma small, restricted to distal third of cell; dark brown spot in distal third of *stigmasaum*. Hindwing unmarked. Preclunial abdominal segments partially ringed with brown, on creamy yellow background; rings absent ventrally and mostly broken along four series, one on each side of dorsal midline and one on each side more laterally; rings broad and running together along dorsal midline. Terminal abdominal segments mottled yellow, white, and medium brown.

HOLOTYPE ♀: Pinar del Río Prov.: Soroa, April, 1967, F.Z.

Indiopsocus alticola, new species

DIAGNOSIS: See key to species.

Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3873	1468	493	172	24	0.46	0.32	0.25	1.43	0.77

MORPHOLOGY: Forewing (fig. 186): pterostigma of moderate depth with short spur vein from posterior apex; *stigmasaum* present

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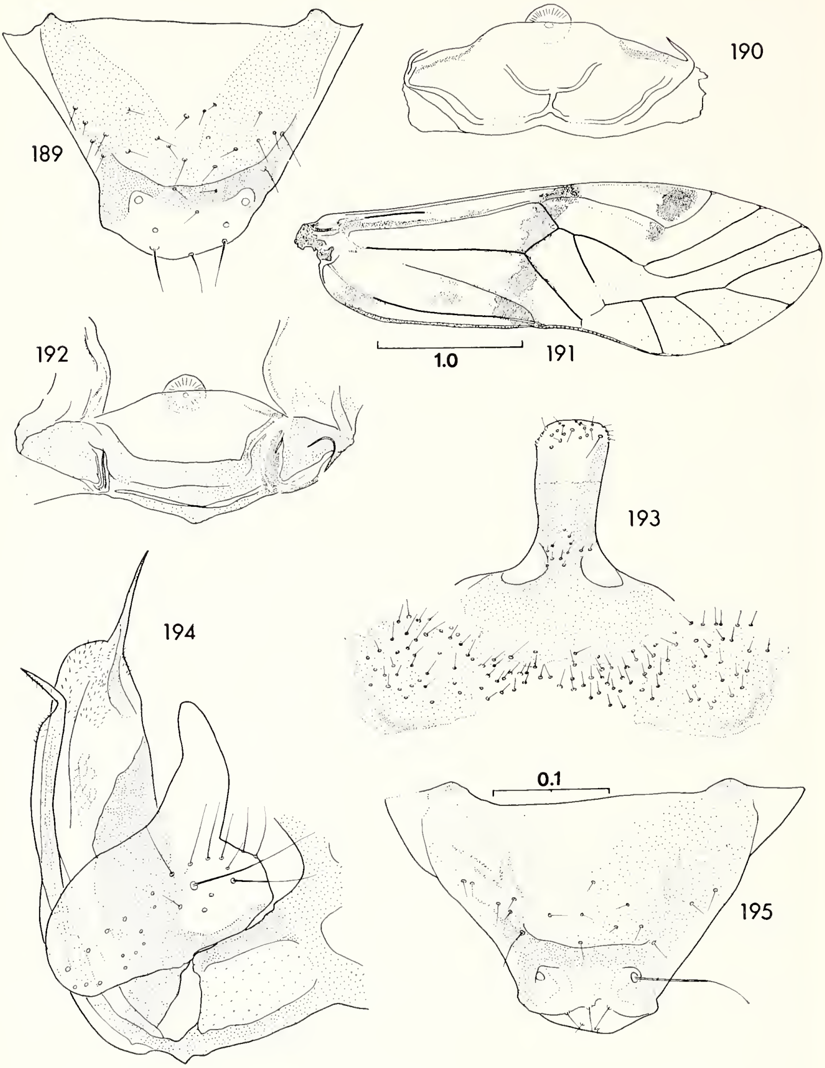
FIGS. 181–188. Structures of Cuban *Indiopsocus*. Figs. 181–185. *I. pallidus*, new species ♀. Fig. 181. Forewing. Fig. 182. Epiproct. Fig. 183. Ninth sternum, scale of Fig. 182. Fig. 184. Gonapophyses, scale of Fig. 182. Fig. 185. Subgenital plate, half scale of Fig. 182. Figs. 186–188. *I. alticola*, new species ♀. Fig. 186. Forewing. Fig. 187. Subgenital plate. Fig. 188. Gonapophyses, scale of Fig. 182.



FIGS. 189–195. Structures of Cuban *Indiopsocus*. Figs. 189–190. *I. alticola*, new species ♀. Fig. 189. Epiproct, scale of Fig. 195. Fig. 190. Ninth sternum, scale of Fig. 195. Figs. 191–195. *I. ceterus*, new species ♀. Fig. 191. Forewing. Fig. 192. Ninth sternum, scale of Fig. 195. Fig. 193. Subgenital plate, half scale of Fig. 195. Fig. 194. Gonapophyses, scale of Fig. 195. Fig. 195. Epiproct.

from base of pterostigma to spur vein; Rs and M fused relatively long distance; first segment of Cu_{1a} shorter than fused $M\text{-}Cu_{1a}$.

Terminal abdominal segments—Subgenital plate (fig. 187) with distal process slightly constricted basally, beset at apex with four long setae and numerous shorter ones, heavily sclerotized laterally, sclerotized strip of each side receding from edge at base of process then curving laterally to meet posterior margin of plate; pigmented basal area as two broad arms each directed anterolaterally and terminating in an irregular broader area; large posteromedian field of plate bare of setae except for very few small ones. Gonapophyses (fig. 188) with first valvula relatively broad, curved, with its acuminate tip recurved; second valvula broad in middle, somewhat narrowing toward apex, rounded apically with long, slender, apical process curved at tip; valvula beset with numerous short spines around base of apical process; third valvula with setose basal lobe reduced, and glabrous distal lobe greatly enlarged as bulbous expansion all along posterior and median margins of basal lobe and extending as long finger-like projection dorsolateral to second valvula. Ninth sternum (fig. 190) with transverse sclerite of ropy pattern around edges anterior to spermapore. Paraproct normal for subfamily, with 22–24 trichobothria on sense cushion. Epiproct (fig. 189) truncated-pyramidal with heavily sclerotized, curved, transverse bar near tip continued out each side to tip, setting off field of seven long setae.

Color (in alcohol): Almost exactly as described for *I. cubanus*, differing in details of forewing markings: transverse band before middle not tending to be broken in radial cell; cell Cu_2 with distinct brown spot in middle.

Holotype ♀: Cuba: Oriente Prov.: Loma del Gato, Sierra Maestra, May 26–28, 1959, M.W.S.

Note: A single female with the head missing, from Florida Blanca, Oriente Province, resembles this one closely in external genitalia but differs in several wing marking features. Although it may be a distinct species, I decline to describe it on such poor material.

Indiopsocus ceterus, new species

Diagnosis: See accompanying key.

Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
3598	1412	470	—	24	0.46	0.32	0.23	1.43	0.71

Morphology: Forewing (fig. 191) as described for *I. alticola*. Terminal abdominal segments—Subgenital plate (fig. 193) much as in *I. alticola*, differing in having sclerotized strips of distal process much more distinct and receding much further from edge before rejoining it; pigmented basal area broad quadrate region with short arm directed laterally from each side at its anterior end, each arm terminating laterally as quadrate region. Gonapophyses (fig. 194) as in *I. alticola* except glabrous distal lobe of third valvula extending only posteriorly, not medially from setose basal lobe. Ninth sternum (fig. 192) with transverse sclerite more narrow in middle and broader laterally than in *I. alticola*. Epiproct as in figure 195; paraproct as in *I. alticola*.

COLOR (in alcohol): Almost exactly as in *I. cubanus*, differing as follows. V-shaped mark of frons with arms broadened only at their anterior points of contact with postclypeus. Forewing with transverse brown band before middle relatively narrow but complete except for narrow break before vein Cu$_2$; cell Cu$_2$ with brown spot in middle. Preclunial abdominal segments each with transverse brown band not continuous ventrally.

HOLOTYPE ♀: Cuba: Oriente Prov.: Mayarí, June, 1967, F.Z.

KEY TO THE CUBAN SPECIES OF INDIOPSOCUS

1. Forewing extensively marked with brown, including submarginal band through cells R$_5$, M$_1$, M$_2$, M$_3$, and Cu$_{1a}$. Males with phallosome triangular, posterior apex drawn out into acuminate process 2

   Forewings not so extensively marked with brown, lacking submarginal band through cells indicated. Males, where known, with phallosome four-sided 4

2. Brown spot in cell M$_3$ of forewing with large clear center; a distinct brown spot in distal third of cell R$_1$ and another in distal half of cell R$_3$ 3

   Brown spot in cell M$_3$ of forewing with small clear center or of uniform color; vague brown spot in distal third of cell R$_1$ and another in distal half of cell R$_3$ .... *I. variegatus*, new species

3. Male with basal teeth of ridge of hypandrium not much larger than more distal teeth; posterior margin of shelf over male epiproct not clearly demarcated from rest of shelf. Brown band in cell M$_2$ of forewing weakly developed .... *I. microvariegatus*, new species

   Male with basal teeth of ridge of hypandrium much larger than more distal teeth; posterior margin of shelf over male epiproct clearly demarcated from rest of shelf. Brown band in cell M$_2$ well developed .... *I. dentatus*, new species

4. Phallosome with two posteriorly directed processes from its posterior margin. Heavily sclerotized frame of female epiproct setting off large clear area including about distal two-thirds of epiproct .... *I. affinis*, new species

Phallosome (where male known) with only one posteriorly directed process from its posterior margin. Heavily sclerotized frame of female epiproct setting off smaller clear area, including only distal half or less of epiproct, or absent 5

5. Transverse band before middle of forewing reduced to brown border of R_1 in radial cell; anal cell colorless .... *I. pallidus*, new species

Anal cell at least partially brown in basal third; transverse band before middle of forewing generally traversing radial cell, or at least developed as brown border of R_1 and M in this cell 6

6. No heavily sclerotized frame of female epiproct. Tooth rows of hypandrium continuous, with no breaks .... *I. cubanus* (Banks)

Heavily sclerotized frame enclosing clear area present on female epiproct. Hypandrium (where male known) without distinct tooth rows or with two large basal teeth in one row isolated from other teeth by spaces 7

7. Pterostigma almost completely brown; transverse brown band before middle in forewing reduced in radial cell to brown borders of veins Rs and M. Male with hypandrial tooth rows and with two large basal teeth in one row separated by spaces from other teeth .... *I. camagueyensis*, new species

Pterostigma brown at most in distal half; transverse brown band before middle of forewing better developed in radial cell than described above. Males, where known, without distinct hypandrial tooth rows 8

8. Subgenital plate with setae of basal pigmented area reaching base of distal process in middle; poorly defined transverse pigment band across distal process just distad of middle. Distal process of phallosome acuminate apically .... *I. ubiquitus*, new species

Subgenital plate with bare area before base of distal process; no transverse pigment band across distal process 9

9. Bare area before distal process of subgenital plate narrow, about as wide as arm of basal pigmented area. Distal process of phallosome truncated apically .... *I. texanus* (Aaron)

Bare area before distal process of subgenital plate wide, about three times width of arm of basal pigmented area. Males unknown 10

10. Third valvula with glabrous distal lobe greatly expanded medially as well as posteriorly from borders of setose basal lobe; pigmentation in glabrous basal region of subgenital plate developed as two broad diverging arms, leaving unpigmented a large anterior triangular area .... *I. alticola*, new species

Third valvula with glabrous distal lobe expanded only posteriorly, not medially, from borders of setose basal lobe. Pigmentation of glabrous basal region of subgenital plate quadrate, covering almost entire region .... *I. ceterus*, new species

Trichadenotecnum pardus Badonnel

T. pardus Badonnel, 1955, p. 231.

Diagnosis: Forewing (Badonnel, 1955, fig. 535) marked with scattered small spots but with distinct indication of radial spotting pattern in distal cells. Subgenital plate (Badonnel, 1955, fig. 536) in its dorsal membrane with two regions of slender thickenings arranged as spirals or concentric circles.

The species was described adequately by Badonnel (1955). It was originally described from Angola. Badonnel (1967) recorded it from Madagascar and noted that *T. pardidum* Thornton, from Hong Kong, probably is a synonym. In the American Tropics it is widespread. In addition to the Cuban specimen noted below, I have seen material from Florida, Puerto Rico, Mexico, Trinidad (West Indies), Surinam, and Brazil.

Genitalic preparations were made of seven individuals (three from Florida and one each from Puerto Rico, Mexico, Trinidad, and Brazil). These were compared with published descriptions of *T. pardus* and *T. pardidum.* All have very sparse spinelets on the edge of the third valvula. The circular sclerotizations of the inner membrane of the subgenital plate are in the form of a complexly broken and branched spiral, which can also be interpreted as broken and branched concentric circles. The heaviness of these sclerites varies, perhaps with staining or age. The material is clearly the same form as the African one.

Of the 40 adult specimens on hand, all are females. Badonnel, likewise, had only females from Angola and Madagascar. From these data, parthenogenesis seems likely.

Record: Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, 1 ♀, M.W.S.

Ptycta lineata, new species

Diagnosis: Median sclerotized strap of hypandrium very narrow, with fine denticles on right edge. Phallosome with bifid distal process. Preclunial abdominal segments marked with five longitudinal brown bands on creamy white background (a middorsal band and a dorsolateral and lateral to each side).

Male. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
2606	1024	368	100	20	0.20	0.36	0.27	0.56	0.77

Morphology: Forewing (fig. 196) with pterostigma of moderate depth with *stigmasaum* from base to posterior apex. Rs and M joined moderate distance. Free segment of Cu_{1a} before junction with M shorter than joined veins.

Terminal abdominal segments—Hypandrium (figs. 199, 200) with median sclerotized strap curving slightly right from base toward apex. Phallosome (fig. 197) with widened area on each side near base; apex drawn out into slender process bifid near tip, resulting two prongs both acuminate and pointing somewhat leftward. Clunium heavily sclerotized on margin on each side before base of paraproct and adjacent lateral corner of epiproct. Paraproct with long, slender distal process. Epiproct (fig. 198) of two flaps apparently held semi-rigidly at about right angles to each other. Entire structure heavily sclerotized on rim, latter shagreened.

COLOR (in alcohol): Compound eyes black. Body in general pale yellowish brown with darker brown markings. Vertex medium brown along posterior margin, borders of compound eyes and midline, latter stopping just before ocellar interval. Postclypeus with thin dark brown striations in medium brown background forming transverse row centered above middle. Frons with medium brown V-shaped mark in front of ocellar interval. Thorax medium brown, paler along dorsal midline and around wing bases. Legs very pale brown, second tarsomere and distal ring on each femur darker. In forewing (fig. 196) pterostigma and *stigmasaum* brown in their distal two-thirds; free portion of M closing radial cell with brown border continuing on and slightly beyond Rs-M junction. Costal cell pale brown most of its length; faint brown spot distally in radial cell. Faint brown spot posterior to $M\text{-}Cu_1$ separation and another at nodulus. Anal cell pale brown from near base to beyond middle. Forewing otherwise unmarked. Hindwing unmarked. Preclunial abdominal segments as described in diagnosis. Terminal segments pale brown.

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
2471	973	315	108	17	0.34	0.24	0.17	1.42	0.69

MORPHOLOGY: Forewing with minute spur vein from posterior apex of pterostigma; basal segment of vein Cu_{1a} about same length as $M\text{-}Cu_{1a}$ fusion.

Terminal abdominal segments—Subgenital plate (fig. 203) with distal process short, broad, truncated apically, beset at apex with 13 setae, four of them longer than others; field of minute setae in middle of process; toward each edge of process a faint lengthwise band of deeper sclerotization; basal pigmentation forming a Y-shaped area with arms only slightly widened anterolaterally. Gonapophyses (fig.

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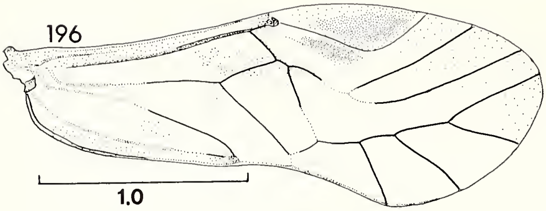

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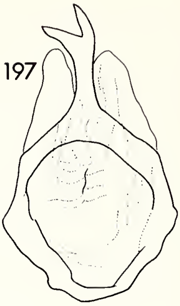

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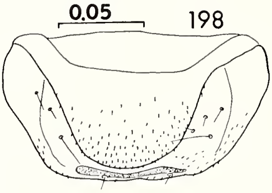

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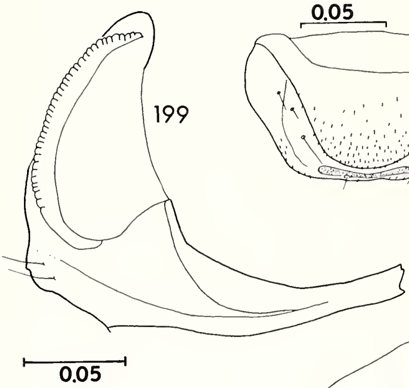

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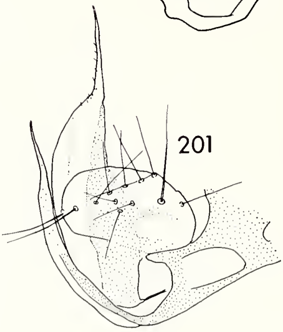

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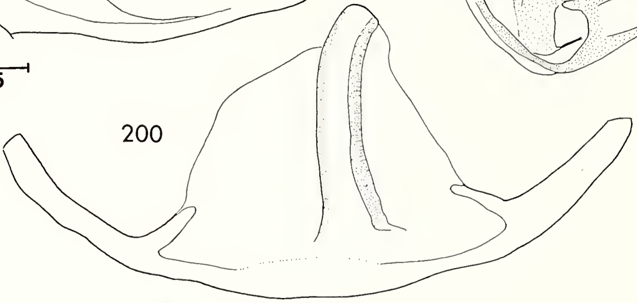

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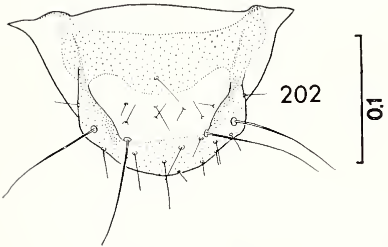

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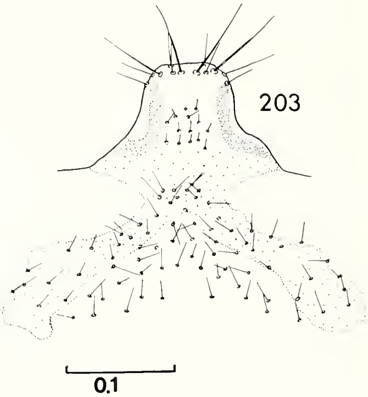

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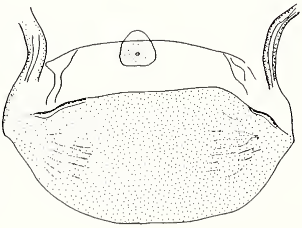


201): first valvula slender throughout, with long, acuminate tip bearing a few minute backward directed spines; second valvula gradually tapering distally toward long, acuminate distal process; third valvula with very short distal lobe, line of long setae across basal lobe and a few scattered setae basad of line. Ninth sternum (fig. 204) with large, elliptical sclerotized plate including spermapore. Paraproct normal for subfamily, with 20–23 trichobothria. Epiproct (fig. 202) semicircular, heavily sclerotized near edges in posterior half, bearing four long setae near posterior margin.

COLOR (in alcohol): As in male except purplish brown spot each side of V-shaped mark on frons; transverse band of striations of postclypeus forming distinct angle with its vertex anterior.

HOLOTYPE ♂: Oriente Prov.: Florida Blanca nr. Alto Songo, May 23–24, 1959, M.W.S.

ALLOTYPE: Pinar del Río Prov.: Aspiro-Rangel, June 16, 1959, M.W.S.

PARATYPE ♀: Habana Prov.: Marianao, Dec., 1964, F.Z.

SUBFAMILY AMPHIGERONTIINAE BADONNEL

Blaste Kolbe

Thornton (1960) has pointed out the tenuousness of the application of this name by Roesler (1944). I have compared all species of Psocidae known to me from northeastern United States with a translation of Kolbe's (1883) description of *Blaste* and *B. juvenilis*, and I find the closest fit to be with '*Psocus*' *quietus* Hagen. This suggests that the name may be correctly applied, but final proof can come only from examination of the type of *B. juvenilis*, if it exists.

In my opinion, the groups that have been assigned as subgenera to *Blaste* (Smithers, 1967 modified by Badonnel, 1967) should be recognized as genera. A large number of American species, including the Cuban species dealt with here, fall into *Blaste* in this restricted sense, and this assemblage will require classification above the species level.

←

FIGS. 196–204. Structures of *Ptycta lineata*, new species. Fig. 196. ♂ forewing. Fig. 197. ♂ phallosome, scale of Fig. 202. Fig. 198. ♂ epiproct. Fig. 199. ♂ hypandrium, lateral view. Fig. 200. ♂ hypandrium, ventral view. Fig. 201. ♀ gonapophyses, scale of Fig. 202. Fig. 202. ♀ epiproct. Fig. 203. ♀ subgenital plate. Fig. 204. ♀ ninth sternum, twice scale of Fig. 203.

Blaste immobilis, new species

Diagnosis: Differing from African species *B. angolensis* Badonnel and from Madagascan species *B. vadoni* Badonnel in having median pointed process distally on hypandrium and from Madagascan species *B. poliopterus* Smithers by having median process relatively much longer. Differing from Madagascan species *B. pauliani* Badonnel in details of wing markings. Differing from described North American species in details of male external genitalia.

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
3174	1257	368	153	21	0.25	0.29	0.23	0.87	0.81

Morphology: Forewing (fig. 205): pterostigma of moderate depth with *stigmasaum* from its base to posterior apex, narrowing distally; Rs and M fused moderate distance; free portion of vein Cu_{1a} before fusion with M shorter than fused portion.

Terminal abdominal segments—Hypandrium (fig. 208) with three well developed terminal prongs, the laterals slender and slightly curving inward, the median decidedly tapering toward tip, tip truncated. Phallosome (fig. 206) of usual form for genus, inner prongs of parameres only slightly outcurved; both prongs acuminate. Posterior margin of clunium heavily sclerotized on each side before base of paraproct and adjacent lateral corner of epiproct. Epiproct semicircular with base heavily sclerotized laterally. Paraproct (fig. 207) with distal prong short and broad.

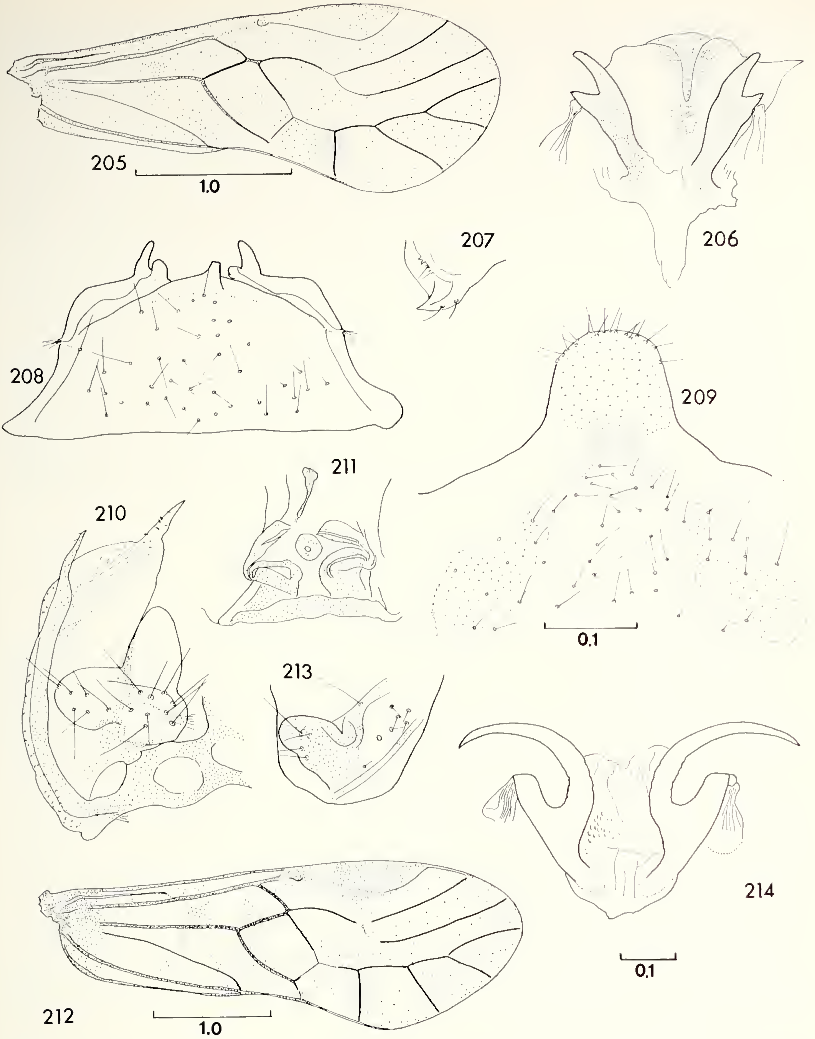
Color (in alcohol): Poorly preserved. Compound eyes dark purple. Body and appendages in general pale to medium brown. Head with creamy yellow area in middle of each parietal region and another to each side of ocellar interval. Postclypeal striations indistinct. Forewing (fig. 205) with pterostigma and *stigmasaum* mostly brown; brown spot bordering vein Cu_{1a} distad of its junction with M; brown spot in middle of cell R extending slightly across into cell Cu_1. Forewing otherwise brown-washed or nearly clear. Hindwing unmarked.

Female. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
264	931	244	146	11	0.40	0.17	0.12	2.26	0.68

Morphology: Micropterous; forewing directed downward, reaching dorsal articulation of mesocoxa. Hindwing about half length of forewing.

Terminal abdominal segments—Subgenital plate (fig. 209) with



Figs. 205–214. Structures of Cuban *Blaste*. Figs. 205–211. *B. immobilis*, new species. Fig. 205. ♂ forewing. Fig. 206. ♂ phallosome, twice scale of Fig. 214. Fig. 207. ♂ distal end of paraproct, twice scale of Fig. 214. Fig. 208. ♂ hypandrium, slightly flattened, scale of Fig. 209. Fig. 209. ♀ subgenital plate. Fig. 210. ♀ gonapophyses, twice scale of Fig. 214. Fig. 211. ♀ ninth sternum, twice scale of Fig. 214. Figs. 212–214. *B. capricornuta*, new species ♂. Fig. 212. Forewing. Fig. 213. Distal end of paraproct, twice scale of Fig. 214. Fig. 214. Phallosome.

short distal process beset at apex with short setae; basal pigmented area with slender arms directed anterolaterally, each terminating as diffuse ovoid area. Gonapophyses (fig. 210): first valvula slender, constricting near apex to form acuminate tip bearing a few minute, backward directed spines. Second valvula broad, deeply folded on median surface, with acuminate tip bearing several minute backward directed spines. Third valvula with basal lobe bearing scattered long setae; distal lobe relatively long. Ninth sternum as in figure 211. Paraproct relatively short, bearing stout seta distally in addition to more slender setae; sense cushions with 14–15 trichobothria. Epiproct approximately semicircular, with free edge heavily sclerotized.

COLOR (in alcohol): Poorly preserved. Preclunial abdominal segments largely creamy yellow, marked dorsally by broad brown longitudinal band to each side of midline, becoming more lateral at about half its length; between these two bands, a third brown band from about middle back to clunium. Terminal abdominal segments pale brown to medium brown.

HOLOTYPE ♂, ALLOTYPE ♀, AND 1 ♂ PARATYPE: Oriente Prov.: La Siberia, Sierra Maestra, June, 1967, F.Z.

Blaste capricornuta, new species

DIAGNOSIS: Distinguishable from all other described species by possessing long, horn-like inner prongs of parameres in male and having second valvulae of female capable of swelling bladder-like in distal halves.

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
4181	1673	500	189	25	0.48	0.27	0.24	1.79	0.90

MORPHOLOGY: Forewing (fig. 212): pterostigma shallow, a *stigmasaum*, narrowing distally, from base to widest region of pterostigma. Rs and M joined by short crossvein. Basal free segment of Cu_{1a} shorter than fused M-Cu_{1a}.

Terminal abdominal segments—Hypandrium (figs. 215, 216) distally with three prongs, the laterals incurved and blunt, the median truncated and bearing ridge in middle on its outer face. Phallosome (fig. 214) with lateral prongs of parameres truncated distally; median prongs very long, outcurved, pointed. Posterior margin of clunium convex before base of epiproct, heavily sclerotized before bases of paraprocts and lateral margins of epiproct. Epiproct rounded distally, heavily sclerotized at lateral corners, with small emargination in middle of base. Paraproct with sense cushion large and central; distal process (fig. 213) very short and broad.

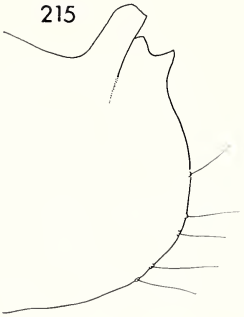
COLOR (in alcohol): Compound eyes black. Body and appendages in general medium to pale brown and creamy yellow, darkest on thoracic tergal lobes. Postclypeal striations vague except median striation in its dorsal half and its two neighbors on each side in their dorsal fourths each emphasized by slender dark brown line. Preclunial abdominal segments with some dark brown subcuticular pigment but its pattern not discernible. Forewing (fig. 212): pterostigma brown except basal third and distal extreme, brown region extending onto *stigmasaum*. Faint brown spot in widest region of cell R_5; veins M_2, M_3, Cu_{1a}, and Cu_{1b} bordered with brown; faint brown spot in distal end of cell R, another in about middle of this cell extending posteriorly into cell Cu_{1b}; faint brown spot bordering vein Cu_1 from its separation from M to about half distance to its branching.

Female. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
4033	1852	483	189	22	0.60	0.23	0.18	2.60	0.80

MORPHOLOGY: Forewing as in male but Rs and M joined short distance; basal segment of Cu_{1a} about equal in length to fused M-Cu_{1a} segment.

Terminal abdominal segments—Subgenital plate (fig. 220) with distal process long and slender, truncated apically, beset with sparse short setae along sides and apex; basal pigmented area a pair of slender, heavily sclerotized arms, strongly diverging and each terminating in quadrate area with small, irregular spot appended on its anterior margin. Ninth sternum (fig. 219) with large, semicircular sclerite before spermapore, and sclerotized arch, angled posterolaterally, around spermapore; arch also enclosing circular sclerite to each side of spermapore. Gonapophyses (fig. 218): first valvula long, slightly curved, slender, with a few minute backward directed spines near tip; second valvula capable of great expansion in distal half, expanding region with shagreened surface medially and laterally, and small papillar field dorsally; this valvula bearing distally a short process. Third valvula with basal lobe bearing scattered long setae forming row along its distal margin; distal lobe of third valvula of moderate length. Epiproct with sclerotized knob ventrally on each side toward posterior margin; dorsally with long setae in two lateral fields. Paraproct normal for group; its sense cushion large, with 32–34 trichobothria.



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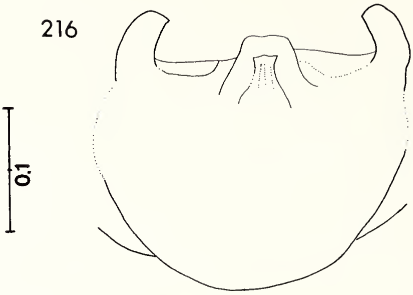

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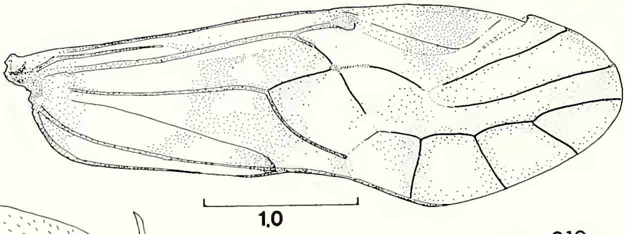

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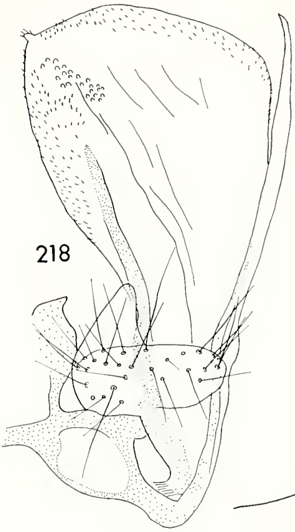

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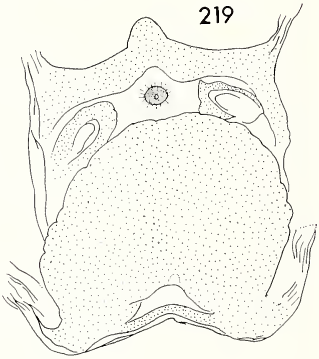

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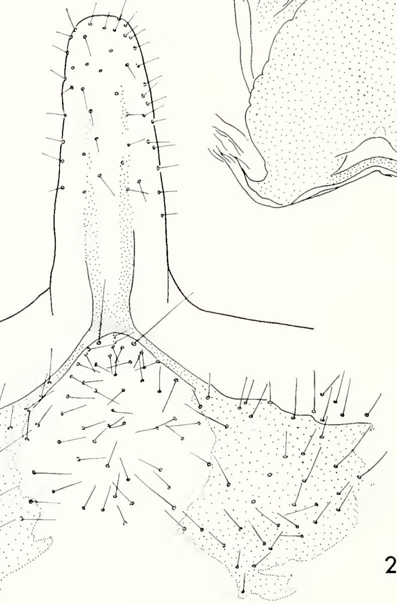

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Color (in alcohol): As in male except as follows: vertex of head with distinct pattern of brown and white, brown along posterior margin, each side of dorsal midline, and in broad border around each compound eye; white in middle of each parietal region, extending narrowly to each side of ocellar interval and along frontal line to antennal base. All brown marks of forewing (fig. 217) more distinct. Abdomen with broad dark brown band on each side of dorsal midline from base to middle, and broad band across middle joining the two longitudinal bands.

Holotype ♂, Allotype ♀, 2 ♂ And 1 ♀ Paratypes And 2 Nymphs: Oriente Prov.: La Siberia, Sierra Maestra, June, 1967, F.Z.

Blaste longicauda, new species

Diagnosis: A sibling species with *B. capricornuta*, having male external genitalia essentially identical. Differing principally as follows: 1) smaller size; 2) male clunium with fewer setae in region anterior to epiproct and paraprocts; 3) male compound eyes relatively larger; 4) forewings without brown borders of veins M_2, M_3, Cu_{1a}, and Cu_{1b}.

Male. Measurements:

FW	T	t_1	t_2	$t_1$ct	IO	D	d	IO/D	PO
3467	1342	424	152	25	0.32	0.32	0.30	1.00	0.94

Morphology: Forewing as in *B. capricornuta* but Rs and M fused a short distance.

Terminal abdominal segments—Median prong of hypandrium (fig. 222) slightly indented distally; lateral prongs only very slightly incurved. Paraproct with distal process (fig. 224) somewhat longer than in *B. capricornuta.*

Color (in alcohol): Similar to that described for *B. capricornuta*, differing as follows: all postclypeal striations relatively distinct; median striation and its immediate neighbors at their dorsal extremes only very slightly more emphasized. In forewing (fig. 221), veins M_2, M_3, Cu_{1a}, and Cu_{1b} without brown borders except for ex-

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Figs. 215–220. Structures of *Blaste capricornuta*, new species. Fig. 215. ♂ distal half of hypandrium, lateral view. Fig. 216. ♂ hypandrium, posterior view. Fig. 217. ♀ forewing. Fig. 218. ♀ gonapophyses, half upper scale. Fig. 219. ♀ ninth sternum to upper scale. Fig. 220. ♀ subgenital plate, half upper scale.

tremely faint brown wash along Cu_{1a}. Preclunial abdominal segments marked as described for female of *B. capricornuta.*

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
3457	1440	386	154	24	0.45	0.25	0.17	1.82	0.70

MORPHOLOGY: Forewing as described for male.

Terminal abdominal segments—Subgenital plate (fig. 226) as described for *B. capricornuta* except distal process beset with short setae over its entire surface beyond its basal third; arms of basal pigmented area joined distally to slender, heavily sclerotized midrib, the latter continuing onto distal process and dissipating in base of process; arms anterolaterally each terminating in quadrate area without anterior appended spot. Ninth sternum (fig. 223) essentially as described for *B. capricornuta.* Gonapophyses (fig. 225): similar to those of *B. capricornuta* but first valvula more curved; second valvula apparently not as greatly expandable and with shorter distal process; third valvula with decidedly shorter distal lobe. Sense cushion of paraproct with 27–30 trichobothria. Epiproct as described for *B. capricornuta.*

COLOR (in alcohol): As in male with following differences; postclypeal striations emphasized dorsomedially as described for *B. capricornuta*; brown spot of pterostigma not reaching anterior border.

HOLOTYPE ♂ AND ALLOTYPE ♀: Oriente Prov.: Mayari, June, 1967, F.Z.

PARATYPES: Camagüey Prov.: Monte Imías nr. California, June 7, 1959, 1 ♀, M.W.S. Oriente Prov.: Cupeyal, Yateras, June, 1965, 1 ♀, F.Z.

Blaste fasciata, new species

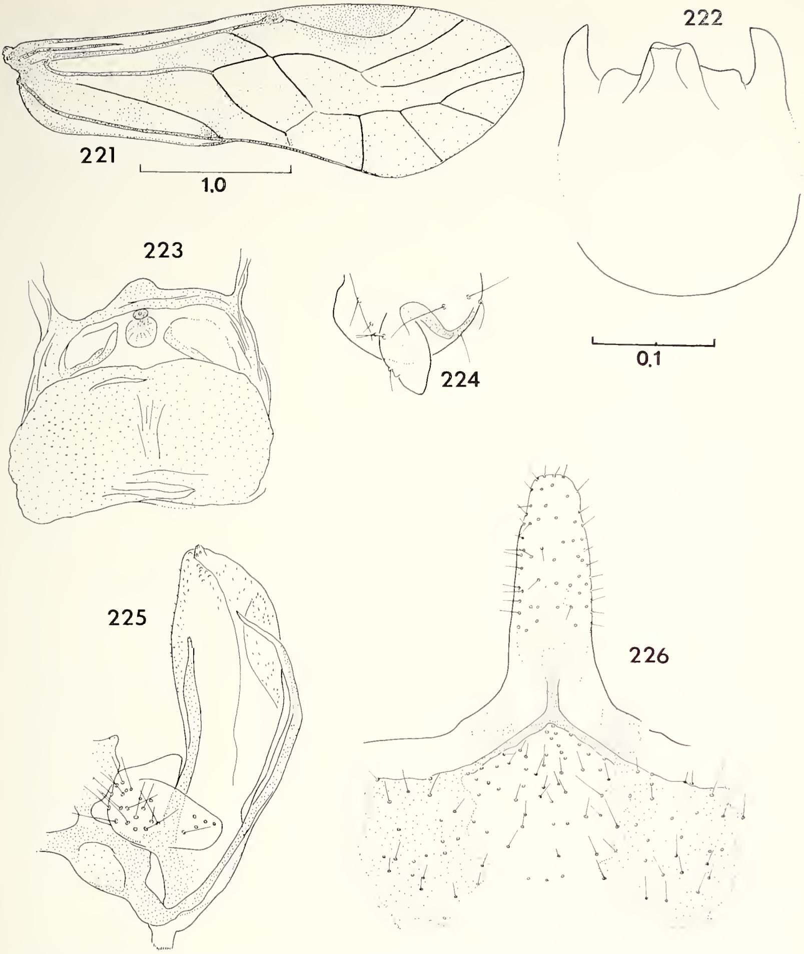
DIAGNOSIS: Very similar to *B. capricornuta,* but differing in having distal process of subgenital plate much shorter; second valvula scarcely, if at all, expandable and bearing long distal process.

Female. Measurements:

FW	T	t_1	t_2	t_1ct	IO	D	d	IO/D	PO
4353	1749	435	203	20	0.53	0.27	0.21	2.00	0.79

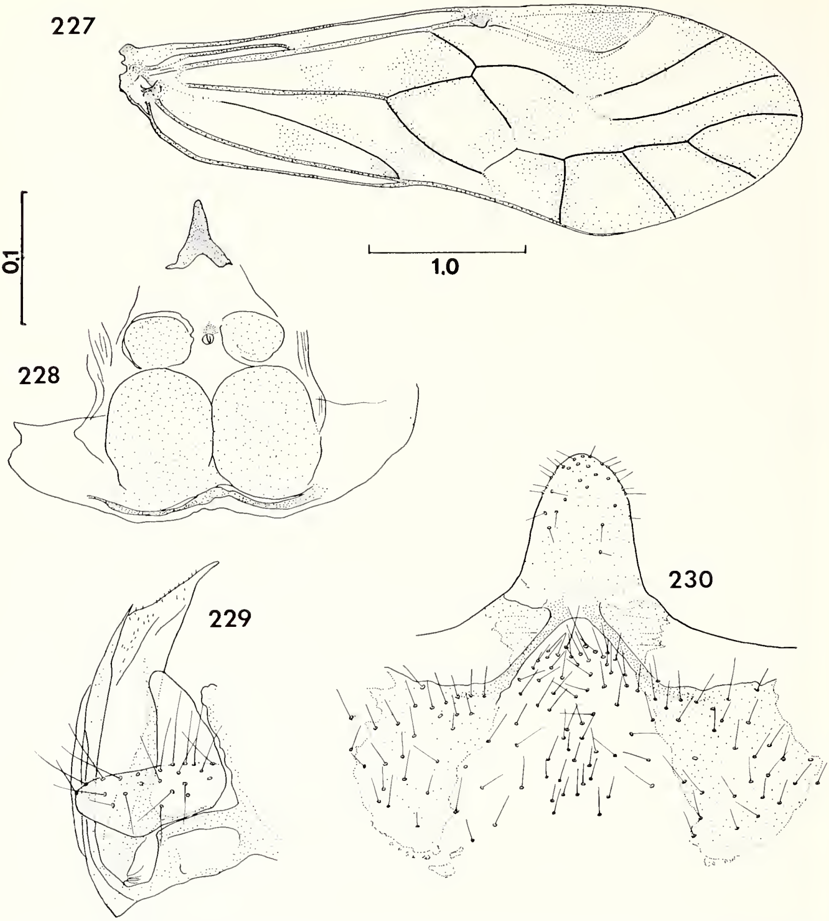
MORPHOLOGY: Forewing (fig. 227): pterostigma of moderate depth, with *stigmasaum* of usual shape for genus. Rs and M joined by crossvein of moderate length; M bowed distally from crossvein to M-Cu_{1a} junction. Free basal segment of Cu_{1a} shorter than fused M-Cu_{1a}.

Terminal abdominal segments—Subgenital plate (fig. 230) with



FIGS. 221–226. Structures of *Blaste longicauda*, new species. Fig. 221. ♂ forewing. Fig. 222. ♂ hypandrium, posterior view. Fig. 223. ♀ ninth sternum, scale of Fig. 222. Fig. 224. ♂ distal end of paraproct, scale of Fig. 222. Fig. 225. ♀ gonapophyses, half scale of Fig. 222. Fig. 226. ♀ subgenital plate, half scale of Fig. 222.

relatively short, posteriorly rounded distal process beset with short setae on and near lateral and distal margins. Basal pigmented area of plate two slender, heavily sclerotized arms diverging anterolaterally and each terminating in quadrate area with small appended spot off anteromedian margin. Ninth sternum (fig. 228) with two circular,



FIGS. 227–230. Structures of *Blaste fasciata*, new species ♀. Figure 227. Forewing. Fig. 228. Ninth sternum. Fig. 229. Gonapophyses, half scale of Fig. 228. Fig. 230. Subgenital plate, half scale of Fig. 228.

well sclerotized plates anterior to spermapore, small, weakly sclerotized circular area to each side of spermapore, and Y-shaped sclerite posterior to spermapore with stem of Y directed posteriorly. Gonapophyses (fig. 229): first valvula narrow, slightly widened in middle, terminating in acuminate point bearing several minute, backward directed spines; second valvula with minute spines on median face and on distal process; third valvula with relatively long distal lobe, basal lobe transverse, with scattered long setae, some forming row along its posterior margin. Epiproct with pair of heavily sclerotized straps posterolaterally on ventral surface; dorsally with arched band of setae from side to side in distal half. Paraproct normal for genus, sense cushion with 28–32 trichobothria.

COLOR (in alcohol): Compound eyes black. Head largely creamy yellow with medium brown spotting along posterior margin and along epicranial line to ocellar interval. Pale brown area bordering each compound eye mesially; U-shaped mark on frons; postclypeal striations very pale brown. Thoracic tergal lobes dark reddish brown; sutures between them broadly bordered with creamy yellow. Thoracic pleura pale to medium brown; coxae pale brown; remainder of legs white except tarsi medium brown. Forewing (fig. 227): pterostigma brown except basal two-fifths and distal extreme, brown mark extending through *stigmasaum* into cell R_1. Brown spot in cell R near distal end, extending into cell R_1 and discoidal cell; brown spot in middle of cell R continuing into cell Cu_{1b}; brown spot in middle of cell Cu_{1b} and another in this cell bordering vein Cu_1; brown spot at nodulus in cell Cu_2 and another in middle of cell; faint brown border of distal margin of wing from distal end of pterostigma to vein Cu_{1a}; faint brown spot in widest region of cell R_5; brown spot in discoidal cell near its distal end; radial fork veins faintly bordered with brown; Cu_{1a} and entire median beyond Cu_{1a} pronouncedly bordered with brown; remainder of wing clear. Hindwing clear, unmarked. Preclunial abdominal segments largely creamy yellow, with brown pattern as follows: two broad brown bands from base on each side of dorsal midline to about two-thirds length of abdomen; at their extremes, continuing ventrally as broad ring around two segments, and connected dorsally in posterior of these two segments; this posterior connection forming part of median dorsal band from middle of abdomen back to clunium. Sclerotized areas of terminal abdominal segments mostly medium brown.

HOLOTYPE ♀: Oriente Prov.: Turquino, Pico Cuba (Sierra Maestra), June, 1963, F.Z.

KEY TO THE CUBAN SPECIES OF BLASTE

1. Female with wings reduced to small scales. Male forewing with decided darkening along vein Cu_{1a}, otherwise with no outstanding marks .... *B. immobilis*, new species
   Females with long wings. In both sexes forewing showing pattern of darker and paler areas, always with pterostigma and two spots in cell R darker 2
2. Distal process of subgenital plate twice as long as its basal width. Second valvula long and inflatable 3

Distal process of subgenital plate little longer than its basal width. Second valvula not inflatable .... *B. fasciata*, new species

3. Transverse compound eye diameter in male about half distance between eyes. Median region of forewing patterned with darker areas bordering veins and paler centers of cells .... *B. capricornuta*, new species

Transverse compound eye diameter in male about equal to distance between eyes. Median region of forewing uniform in color .... *B. longicauda*, new species

KEY TO THE SUBFAMILIES AND GENERA OF CUBAN PSOCIDAE

1. Hypandrium generally asymmetrical and limited in its sclerotization to terminal subgenital sternum. Parameres forming closed frame 2

Hypandrium generally symmetrical, its sclerotization including last two subgenital sterna. Parameres free distally .... Subfamily Amphigerontiinae (single Cuban genus, *Blaste*).

2. Fusion of M and Cu_{1a} short, less than half length of Cu_{1a} from its beginning to fusion. Nymphs without gland hairs .... Subfamily Cerastipsocinae 3

Fusion of M and Cu_{1a} longer, generally more than half length of Cu_{1a} from its beginning to fusion. Nymphs covered with gland hairs .... Subfamily Psocinae 4

3. Antennae exceeding length from head to tip of closed forewing. Forewing membrane deep fumose .... *Cerastipsocus* (single Cuban species, *C. cubanus* Banks).

Antennae less than length from head to tip of closed forewing. Forewing membrane clear .... *Metylophorus* (single Cuban species undetermined)

4. Forewings marked with series of six spots arranged radially in cells R_1, R_3, R_5, M_1, M_2 and M_3 .... *Trichadenotecnum* (single Cuban species, *T. pardus* Badonnel)

Forewings without radial spotting pattern 5

5. Forewing generally with transverse color band in basal half. Phallosome broadest basally .... *Indiopsocus*, new genus

Forewing without transverse color band in basal half. Phallosome broadest in middle .... *Ptycta* (single Cuban species, *P. lineata*, new species)

KEY TO THE SUBORDERS, GROUPS, AND FAMILIES OF CUBAN PSOCOPTERA

1. Antennae with more than 18 flagellomeres; flagellomeres never secondarily annulated. Tarsi three segmented .... Suborder Trogiomorpha 3

Antennae with 15 or fewer flagellomeres; if more than 11 flagellomeres present, some or all of them secondarily annulated. Tarsi two or three segmented 2

2. Antennae with 11 flagellomeres, these lacking secondary annulations .... Suborder Psocomorpha 6

Antennae with 13 to 15 flagellomeres, these with secondary annulations .... Suborder Troctomorpha 4

3. Wings never totally absent. In short winged forms, venation persistent. In long winged forms, veins Cu_2 and IA of forewing ending together on wing margins .... Group Psocatropetae (Family Psyllipsocidae, single Cuban species *Psocatropos microps* Enderlein)

Wings long, reduced, or absent. Venation frequently absent in short-winged forms. In long winged forms, veins Cu_2 and IA of forewing ending separately on wing margin .... Group Atropetae (Family Lepidopsocidae)

4. Wings, when present, never covered with scales; held flat over back when at rest; wings frequently reduced or absent .... Group Nanopsocetae 5

Wings always present, scaly, never held flat, always slanting, over back in repose .... Group Amphientometae (Family Amphientomidae, single Cuban genus, *Amphientomum*)

5. Forewings, when present, with venation well developed, including closed cell and several branching veins; mesothorax and metathorax distinctly separate .... Family Pachytroctidae (single Cuban genus, *Tapinella*)

Forewings, when present, with venation greatly reduced, including no closed cells and only one (the anterior) vein with branch. In all wingless forms, mesothorax and metathorax indistinguishably fused .... Family Liposcelidae

6. Head in anterior view dorsoventrally as long as or longer than its its width. Labrum internally with two oblique, strongly sclerotized ridges clearly showing through cuticle (fig. 39) .... Group Epipsocetae (Family Epipsocidae)

Head in anterior view dorsoventrally shorter than its width. Labrum internally on either side with only small sclerotized tubercle between pair of which lies clear semicircular area bordering anterior labral margin 7

7. Pretarsal claws lacking preapical denticles; each claw subtended by broad pulvillus (fig. 51). Abdomen ventrally with two or three transverse blister-like swellings .... Group Caecilietae 8

Pretarsal claws with or without preapical denticles; pulvillus usually slender or absent; if broad, each claw with preapical denticle. Abdomen ventrally without transverse blister-like swellings 9

8. Forewing with setae on veins of at least basal third of wing nearly upright; setae on R and M-Cu in two ranks .... Family Amphipsocidae

Forewing with setae on all veins decidedly slanting toward wing tip; setae on R and M-Cu not distinctly in two ranks .... Family Caeciliidae (single Cuban genus, *Caecilius*)

9. In long winged forms mesothoracic precoxal bridge wider than mesotrochantin at its base. Female paraproct quadrate or hemispherical, without narrower distal lobe .... Group Homilopsocidea 10

In long winged forms mesothoracic precoxal bridge at its lateral extreme narrower or equal to mesotrochantin at its base. Female paraproct with distal lobe decidedly narrower than basal region .... Group Psocetae 15

10. Margin of forewing between veins R_{4+5} and Cu_{1a} beset with "crossing hairs," i.e. setae in two ranks, the two ranks oriented differently, so that each seta of one rank is crossed in lateral view by seta of other rank 11

Margin of forewing between veins R_{4+5} and Cu_{1a} without "crossing hairs" 13

11. Tarsi three segmented .... Family Philotarsidae (single Cuban genus, *Aaroniella*; single Cuban species, *A. achrysa* [Banks])

Tarsi two segmented 12

12. Forewing venation (fig. 73) largely obscure, showing no branching of Rs or M. Forewing densely beset with setae on membranes as well as veins .... Family Archipsocidae

Forewing venation distinct, always with Rs and M branched. Setae of forewing restricted to veins or their borders .... Family Pseudocaeciliidae

13. Forewing with vein Cu_{1a} present .... Family Lachesillidae

Forewing lacking vein Cu_{1a} 14

14. Pterostigma in forewing constricted basally .... Family Peripsocidae (single Cuban genus, *Peripsocus*)

Pterostigma in forewing not constricted basally .. Family Ectopsocidae

15. Vein Cu_{1a} in forewing joining M by long crossvein .... Family *Hemipsocidae* (single Cuban genus, *Hemipsocus*)

Vein Cu_{1a} in forewing joining M for short distance, at point, or by very short crossvein 16

16. Tarsi three segmented .... Family Myopsocidae

Tarsi two segmented .... Family Psocidae

BIOGEOGRAPHIC SECTION

The Cuban psocid fauna resembles the faunas of other Caribbean islands (these not yet well known), of southern Florida, and of the Gulf Coast of Mexico. There is no generic endemism, both of the genera erected in this paper being known from other parts of the American Tropics. The determined species may be placed in the following biogeographic categories.

I. Endemics and presumed endemics (28 species)

A. With close relatives in the Caribbean islands and/or adjacent mainland (ten species):
Echmepteryx hageni complex species (close relative in Florida Keys), *Amphientomum hystrix*, new species (close relative *A. elongatum* Mockford of Chiapas amber), *Epipsocus ornatus*, new species (close relative *E. icarus* Banks of Hispaniola), *Caecilius pulchellus*, new species (close relatives *C. subflavus* Aaron of southeastern United States and *C. biminiensis* Mockford of Bimini Islands, Bahamas), *Pseudarchipsocus guajiro*, new species (close relative undescribed, in eastern Mexico), *Cerastipsocus cubanus* Banks (close relative *C. venosus* [Burmeister] of eastern United States), *Indiopsocus ubiquitus*, new species (close relative *I. texanus* [Aaron] of Cuba and southeastern United States), *Indiopsocus affinis*, new species (close relative *I. insulanus* [Chapman] of southeastern United States), *Myopsocus clypeofasciatus*, new species (close relative undescribed in Florida), *Phlotodes cubanus*, new species (close relative *P. antillanus*, new species of Cuba, Hispaniola, and Florida).

B. With close relatives outside of Caribbean islands and adjacent mainland (one species):
Ectopsocus pictus, new species (close relatives *E. machadoi* Badonnel of Angola and *E. strauchi* Enderlein of Azores).

C. Region of occurrence of close relatives not known (17 species):
Tapinella aliena (Banks), *Dasydemella dezayasi*, new species, *Graphocaecilius normalis*, new species, *Lachesilla sandersoni*, new species, *Blaste*—four species, *Indiopsocus*—eight species, *Ptycta lineata*, new species.

II. Species occurring on other Caribbean islands and/or adjacent mainland (19 species).

A. Species on other Caribbean islands but not on mainland (two species).
Polypsocus fasciatus Banks (Puerto Rico, Hispaniola), *Caecilius flavibrunneus* Mockford (Bahamas).

B. Species on Floridean, but not Mexican, side of Gulf of Mexico (on other Caribbean islands or not) (nine species):
Embidopsocus laticeps Mockford (Florida), *Caecilius indicator* Mockford (Florida, southern Georgia, Bahamas),

Caecilius tamiami Mockford (southern Florida), *Aaroniella achrysa* (Banks) (Hispaniola, Jamaica, Florida), *Archipsocus floridanus* Mockford (Florida), *Hemipsocus pretiosus* (Banks) (Jamaica, southern Florida), *Indiopsocus texanus* (Aaron) (southeastern United States), *Phlotodes antillanus*, new species (Hispaniola, Florida).

C. Species on Mexican but not Floridean side of Gulf of Mexico (on other Caribbean islands or not) (three species): *Tapinella* sp. (Mexico, Guatemala, British Honduras), *Archipsocus panama* Gurney (southern Mexico, Panama), *Phlotodes minutus*, new species, (Hispaniola, Mexico).

D. Species widespread in tropical and subtropical America, some extending into Temperate Zones (five species): *Thylacella cubana* (Banks) (Florida and Mexico), *Caecilius antillanus* Banks (Virgin Islands, Hispaniola, Jamaica, Surinam, Panama, Mexico, Florida), *Pseudocaecilius citricola* (Ashmead) (Colombia, French Guiana, Puerto Rico, Mexico, southeastern United States), *Cladioneura coriacea* (Roesler) (Brazil, Mexico), *Peripsocus stagnivagus* Chapman (Mexico, southeastern United States).

III. Tropical waifs and cosmopolitan species (13 species):

A. Tropical waifs (ten species):
Proentomum personatum Badonnel, *Echmepteryx falco* Badonnel, *Psocatropos microps* Enderlein, *Lachesilla aethiopica* Enderlein, *Peripsocus pauliana* Badonnel, *Ectopsocus titschacki* Jentsch, *Ectopsocus maindroni* Badonnel, *Ectopsocus vilhenai* Badonnel, *Trichodenotecnum pardus* Badonnel, *Mesepipsocus mobilis* (Hagen).

B. Cosmopolitan species (three species):
Liposcelis bostrychophilus Badonnel, *Liposcelis entomophilus* (Enderlein), *Ectopsocopsis cryptomeriae* (Enderlein).

Category I, endemics, contains the largest number of species. Additional study may show that some of these species are not, in fact, restricted to Cuba. On the basis of much material examined from the other Greater Antillean Islands, the Bahamas, Lesser Antilles, Florida, Mexico, Central America, and northern South America, I am confident that most of the species listed above as endemic will remain in that category.

Category I-C, endemic species for which the regions of occurrence of close relatives are not known, will be reduced as the relationships of the species in this category become established. The four species of *Blaste* and eight of the species of *Indiopsocus* were placed here for convenience. Other species in these genera occur in the Caribbean, but the detailed comparisons necessary to establish the relationships of these with the Cuban species have not yet been made.

In *Blaste* and *Indiopsocus*, some assemblages of closely related species are seen on Cuba which probably formed there. In several genera, isolates on Cuba have diverged from their close relatives on nearby land areas sufficiently so that they can be recognized morphologically as distinct species.

The case of *Ectopsocus pictus*, new species, with close relatives in the mid-Atlantic islands and West Africa, is unique and probably represents a fortuitous long-range dispersal at some unknown time in the past. Alternatively, it may involve a waif which has not yet been detected in its homeland.

Of the species widespread in the Caribbean, very few are restricted to the islands, most of the species occurring also on the mainland. More species are shared between Cuba and Florida than between Cuba and Mexico.

Among the tropical waifs, it is notable that most (all but one) were described from Africa. *Proentomum personatum*, *Lachesilla aethiopica*, and *Trichadenotecnum pardus* (unless *Trichadenotecnum pardidum* Thornton, of Hong Kong, proves to be a synonym of *T. pardus*) have not previously been reported from outside of Africa, although all are widely distributed in the American Tropics. Their introduction from Africa during the slave trade is certainly possible. *Thylacella cubana* is placed as a widespread Tropical American species, but its congeners are all from the Old World Tropics, mostly Africa and Madagascar, and it may prove to be a tropical waif.

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ADDENDUM

After the manuscript of this paper had already undergone final editing, the description of *Spurostigma cuba* Eertmoed came to my attention (Eertmoed, G. E., 1973. The Phenetic Relationships of the Epipsocetae (Psocoptera): the Higher taxa and the species of two new families. Trans. Amer. Ent. Soc. 99:373–414; *S. cuba* p. 404). This brings the number of psocid species known from Cuba to 66 and adds one family. Eertmoed's family name Spurostigmidae should be changed to Spurostigmatidae to conform with Article 29 of the International Code of Zoological Nomenclature (1964). The species belongs in my biogeographic category IA. It goes to couplet 6, Group Epipsocetae in my key to the families, and may be separated from Epipsocidae by presence in *Spurostigma* of vein IIA in the forewing and absence of this vein in the Epipsocids.

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   1949. Principles of animal ecology. Philadelphia and London, W. B. Saunders Co., 837 pp.
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      Transverse fascia on corium irregular, not straight; or fascia absent 8
   5. Dorsum piceous; all marginal areas of pronotum continuously and widely yellowish orange . . . . *ashmeadi* Heidemann
      Dorsum reddish brown; at most only the posterior marginal area of the pronotum yellowish 6

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   Attagenus megatoma: Dahl, 1823, p. 30.—Laporte, 1840, p. 35.—Erichson, 1846, p. 441.—Wollaston, 1854, p. 204.—LeConte, 1854, p. 109.—Chevrolat, 1863, p. 616.—Howe, 1952, p. 40.—Mroczkowski, 1954, p. 7; 1958, p. 4; 1962, p. 6; 1965, p. 668.—Zhantiev, 1963b, p. 421.

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REVISION OF THE NEW WORLD CHAETARTHRIA (COLEOPTERA: HYDROPHILIDAE)

DAVID C. MILLER

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REVISION OF THE NEW WORLD CHAETARTHRIA (COLEOPTERA: HYDROPHILIDAE)

David C. Miller[1]

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Abstract: The New World species of the genus *Chaetarthria* (Coleoptera: Hydrophilidae) are revised. Thirty two species are recognized and divided into five species groups, and the phylogeny of the New World species of the genus is discussed. The following twenty species are described as new: *argentina* (Argentina), *atroides* (Nebraska to Texas), *brasilia* (Brazil), *flava* (Mexico), *goldbachi* (Argentina, Brazil and Venezuela), *granulata* (Brazil), *hermani* (Argentina), *hespera* (southwestern United States), *hintoni* (Mexico), *lateralis* (Chile), *leechi* (California), *magna* (Arizona, California and Mexico), *major* (Honduras and Mexico), *malkini* (Brazil and Venezuela), *ochra* (Arizona, California and Mexico), *spangleri* (Honduras to Mexico), *spinata* (California), *truncata* (California), *utahensis* (Utah), *veracruzensis* (Mexico). *C. bicolor mexicana* Balfour-Browne is reduced to synonymy under *C. bicolor* Sharp, *C. minor* Fall to synonymy under *C. pusilla* Sharp and *C. panthea* d'Orchymont to synonymy under *C. panda* d'Orchymont. A key to species is provided along with descriptions, illustrations and distributional maps for each species.

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INTRODUCTION

The genus *Chaetarthria* was erected by Stephens in 1833 to contain only *Hydrophilus seminulum* Herbst. Subsequently a number of species, from most major areas of the world, have been named but no comprehensive study of the genus has been attempted. The extreme uniformity in external characters shown by these beetles makes it difficult to establish species differences or make determinations without examination of the male genitalia, and these have been described only for a few American species by d'Orchymont (1939) and J. Balfour-Browne (1939). The only available keys are those of d'Orchymont (1939) for six light colored American species and Leech and Chandler (1956: 343) for the three species then thought to occur in California. Fall (1901: 216) appears to have been the first author to point out the modified protibiae in males of many species. Leech and Chandler used only size and color in their key, while d'Orchymont used the aedeagus, the male protibiae, and the elytral vestiture.

Previously there have been twenty two apparently valid species named in the genus *Chaetarthria*, of which fifteen have been from the New World. The present study raises the known New World fauna to thirty two species, and undoubtedly there are at least several more which I have not had a chance to study. Indeed, several of the species treated in this paper, particularly some from South America, may prove to be composite when additional material is available for study.

BIOLOGY OF CHAETARTHRIA

Members of the genus *Chaetarthria* are tiny (one to three millimeters long), hemispherical, black to yellow beetles which usually burrow in the sand at the margins of streams or rivers, but beyond this virtually nothing is known of their biology. Mr. Hugh B. Leech, of the California Academy of Sciences, who has collected the genus extensively, states (*in litt.*) that he has always found them in sand containing little silt, never in mud, and always where the water was rather quiet. Since the beetles apparently remain in their burrows during the day and emerge onto the surface only at night, they are seldom seen by the casual collector although in many areas they are apparently not rare. Mr. Leech indicates that he collects them by pushing sand into the water and letting the beetles float to the top, and that it is difficult to predict where along the course of a riverbank they will be found. From Arizona south through Latin America some very long series have been collected at light traps.

The only published observations on these beetles, other than purely systematic works, appear to be those of Hrbáček (1943), who briefly reported the habits and life history of the European *C. seminulum* including a redescription of the larva, and a note by Schwarz (1914: 165) on the occurrence of what was probably *C. punctulata* or possibly *C. pusilla* (reported as *C. minor*) along a creek flowing from a hot spring in Arizona. I have seen material of both of these species collected by Hubbard and Schwarz in Arizona (USNM) but the label data are too imprecise to determine which specimens are the ones on which Schwarz' report is based. The stream at the point of collecting was apparently over 90°F, but nothing is said of the temperature of the adjacent sand.

There may be differences between species or even populations in their normal distance from the water. Hrbáček (1943) stated that neither the adults nor the larvae of the *C. seminulum* which he reared ever went *into* the water, but Mr. Jan Landin, of the University of Stockholm, informs me (*in litt.*) that the adults of *seminulum* occur in the water itself near Stockholm, Sweden. Dr. Lee Herman, of the American Museum of Natural History, has collected *pallida* on Hatteras Island, off the coast of North Carolina, in damp sand apparently not near any flowing water. Dr. Herman also informs me that at times the burrows of *Chaetarthria* are visible from above as humped up trails of sand, so that at times he has confused them with the burrows of the *Bledius* (Staphylinidae) which he was attempting to collect.

Ecological differences between the species may be rather subtle, as many series collected at one time and place contain two or more species and this is true for collections from the water's edge as well as from light traps. Mr. Philip Perkins, of California State University, Long Beach (*in litt.*) has found fairly good habitat segregation by carefully collecting the species found at a study site on the San Gabriel River, Los Angeles County, California, where the species seem to divide according to the coarseness of the substrate. Mr. Perkins has also reared *C. hespera* in the laboratory, and plans to describe the life history of this species and report on his ecological studies in the near future.

Examination of slide mounted specimens of several species of *Chaetarthria* has revealed that there is a patch of bumps on the under side of each elytron and a corresponding patch of ridges on the abdominal dorsum. These do not look like typical stridulatory structures, and live specimens of *Chaetarthria* have never been observed to make sounds. Thus, the function of these structures must be considered unknown. They could be sound producing structures, however, and sound production is known in several genera of Hydrophilidae (Van Tassell 1965, Ryker 1972). In these genera sound functions in courtship and probably also in stress situations.

An obvious and interesting unique character of the beetles of the genera which make up the tribe Chaetarthriini (i.e. *Chaetarthria*, *Thysanarthria* and *Hemisphaera*) is the two masses of gelatinous material contained in a bilobed excavation of the first two visible abdominal sternites. Dr. Norman Saks, of the City College of New York, has determined the material in *Chaetarthria* to be a globulin protein, but nothing is known of its function. It has been speculated (Richmond 1920) that this structure might in some way be involved with carrying the egg cases around on the under side of the abdomen as in *Helochares*, etc. but this is denied by Mr. Perkins (*in litt.*), who has reared these beetles. Since both sexes possess the gelatinous mass, egg carrying is an unlikely function for it.

METHODS

Nearly all specimens were examined dry, on points, and most were dissected to determine sex and extract genitalia from males. Unfortunately it is not possible to know the sex of specimens of *Chaetarthria* externally unless one knows with which species one is working as a few New World species and all Old World species examined lack any external sexual dimorphism. Male genitalia were occasionally left attached to the beetle, but more often were mounted on a small point below the specimen. In most cases the aedeagus, despite being very small, is heavily enough sclerotized so that it maintains its shape upon drying. Where there were exceptions to this, as in *C. pallida* and other pale colored South American species related to it, where the parameres are largely membranous dorsally, or in *C. mexicana* and *C. bicolor* which have thin, wing-like parameres, and teneral specimens of other species, it was occasionally helpful to place a drop of ammonia on the aedeagus while studying it to help restore the normal shape. However in all cases the differences between species in the structure of the aedeagus are obvious even in dry specimens.

Measurements were made through the microscope (Leitz binocular dissecting microscope) using an ocular micrometer. Since the total length of the specimen can appear to be very different, depending on whether the head is extended or not, the elytral length (EL) was measured instead. This was measured in dorsal view along the suture and an attempt was made to position the specimen to be exactly horizontal since even a slight tilt can change the measurement somewhat. Greatest width (GW) is the combined width of both elytra at the widest point, generally slightly behind the base of the elytra. Greatest height (GH) is the distance from the elytral suture to the ventral edge of one elytron, measured in exact lateral view at the point where the beetle is thickest. The portion of the thorax which extends below the elytral edge was ignored in this measurement. The length of the parameres (PL) was taken in dorsal view. The ratio of the length of the male protibia to its greatest width was taken viewing the anterior face of the protibia. The ratio of the length of the basal piece to the length of the parameres was taken viewing the aedeagus from the side. The plates or discs on the inner face of the apical portion of the male protibia were counted. The plates, especially, must be counted with great care as the flat area of the protibia on either side of the row of plates can easily give the appearance of being an additional plate.

Distributional maps show males only unless females can be identified fairly certainly.

TAXONOMIC PHILOSOPHY

In general the species of *Chaetarthria* look very much alike, usable taxonomic characters being very few. Thus I have made the species descriptions fairly short, concentrating on the few diagnostic characters. As d'Orchymont (1939: 3) explained in discussing why he presented only drawings and a key to distinguish the species of his "*pallida* group," rather than full descriptions, "The descriptions would all repeat each other."

With the advent of current knowledge concerning polytypic and geographically variable species, it has become unwise for a taxonomist to erect new species on the basis of minor differences in specimens, especially when there is not enough material available to give a clear picture of the geographic distribution of the character states or of the presence or absence of possible intergrades. Thus in this work I have adopted the philosophy of a relative "lumper." Several of the species treated are shown to be variable and a few may prove to be composite once sufficient material is studied. In certain cases such as the North American *C. pallida*, *C. bicolor* and *C. pusilla* enough material was available so that the morphological forms were shown to geographically replace one another, thus corresponding to the concepts of subspecies and/or cline (however see discussion of variability in *pallida*). I do not feel that formal taxonomic designation of subspecies serves any important purpose, and it creates problems in nomenclature, so I have merely described the geographic variation in detail without naming the forms.

Less material has been available for the species from South America, so there are several species problems among them which have been less satisfactorily resolved. *C. panda* and *C. goldbachi,* as treated in this paper, both represent rather diverse groups of specimens and each might prove to be more than a single species when more material is studied. By contrast *C. hermani* is shown to be distinct, probably, from *C. argentina* because the two occur sympatrically, although the morphological differences between them are slight.

TAXONOMIC CHARACTERS

The species of *Chaetarthria* are quite uniform in appearance. Size is of value only to separate the largest and smallest species. Color has some value but generally only separates the species into a group which are yellow to light brown dorsally and a group which are dark brown to black dorsally, and *C. bicolor* includes populations which fit into each group. Very often there are larval mites under the elytra which, usually being whitish, make the elytral disc appear paler.

Punctation and pubescence differ slightly from species to species but they also often vary within species and thus are not diagnostic except in extreme cases such as the very evident, coarse vestiture of *C. granulata.* The apex of the elytron frequently has the punctures arranged subserially and these may continue to short longitudinal grooves at the extreme tip. In *C. truncata* and the darkly colored, northern populations of *C. bicolor*, these grooves are rather deep and are distinctive enough to aid in identifying the species.

In several species the head and pronotum have a very regular, fine and shallow micropunctation between the major punctures. This micropunctation is extremely close set, and d'Orchymont (1939) and Balfour-Browne (1939) have referred to the condition as microreticulate. These authors have used this as a species character, but several members of the genus from South America vary geographically and/or within populations in this respect.

Males present a set of primary and secondary sexual characters which are considerably more useful. As is often the case in the Hydrophilidae and in many other insects the aedeagus is distinctive for each species. In some cases it is geographically variable, but these differences are generally less than the differences between species. An exception to this is the fact that the aedeagus of *C. mexicana* differs from that of *C. bicolor* about as much as the geographic forms of the latter species differ from each other. Several species from South America have aedeagi which differ in different localities, but the differences are slight and, except for the case of *C. hermani*, so little is known of the geographic distribution of the forms that it is not possible to prove that they represent separate species. This is more fully discussed in the previous section.

In most species the protibiae of the males are elbowed or at least sinuate on the inner margin, and the medial face of the apical portion bears spines, transverse plates or stalked discs (see for example figures 15, 20, and 80). Except for several yellowish to brownish species from South America, the structure of the male protibiae appears to be at least slightly different for each species although the differences may be only in the number of plates in some cases. These modifications are possibly aids to grasping the female during mating; the discs may function as suction discs for example. Structures of this sort seem to be common in water beetles, perhaps because the female water beetle would be wet while the male was grasping her. When there are plates on the protibia they are firmly and smoothly attached to the anterior margin of the medial face with their free, rounded edges often lifted well off the face of the protibia posteriorly. This smooth anterior attachment would seem to help protect the plates from being knocked off when the beetle burrows in the substrate, which would not be the case if the free edges of the plates were anterior. When there are stalked discs they are generally set behind a ledge or projection on the anterior edge of the protibia, which apparently protects them similarly. In *C. spinata* the middle legs of the males are also modified, the mesofemur bearing a broad, short tooth on its posterior margin which may also be of aid in grasping the female.

In *C. bicolor* and related species the males also have the metasternum modified in that there is a longitudinal row of three or more bristles, slightly larger than the surrounding hairs, on each side of the metasternal midline, near the posterior of the segment. I am unable to offer any good suggestion as to the possible function of this structure except that it also might be involved in holding the female securely during mating.

THE GENUS **CHAETARTHRIA** STEPHENS

Chaetarthria Stephens, 1833, p. 22. Type species: *Hydrophilus seminulum* Herbst, 1797 (cited as Paykull, 1798). For misspellings see Knisch, 1924, p. 224.

Cyllidium Erichson, 1837, p. 211. Type species: same as above.

DESCRIPTION: Approximately hemispherical to oval beetles 1.1 to 2.5 mm. in length with head deflexed, capable of rolling up slightly.

Head reddish brown to black, eyes usually somewhat protuberant from sides of head. Antennae eight segmented,[1] basal segment very long, bowed with center pointing anteriorly, second nearly globular, third through fifth tiny, sixth through eighth forming pubescent club. Labrum transverse, bearing thick brush of long, golden hairs along ventral margin. Maxillary palpi three segmented, usually short and thick, middle segment less than half length of others. Labium slightly broader than long, palpi three segmented, usually short, middle segment much longer than others, apical segment bearing tuft of hairs longer than segment. Dorsum variable from smooth and glabrous to rather weakly punctate and pubescent, pubescence and punctation of elytra generally stronger than that of head and pronotum. Pronotum black to yellow, transverse. Scutellum triangular, slightly longer than basal width. Elytra black to yellow, without striae except sutural ones but sometimes with several short grooves at apex, sutural striae traceable from apex for less than half to about three quarters of way to base, elytral margin beaded and with single row of golden setae just mesad to bead. Venter black to dark reddish or yellowish brown with appendages and prosternum often paler. Mesosternum with small, pointed, pyramidal elevation medially just anterior to mesocoxae. Prosternum and metasternum with no keels or other modifications. Procoxae transverse, oblique, fairly prominent, very narrowly separated. Prothoracic and mesothoracic femora with hydrofuge pubescence. Metathoracic legs usually not pubescent, bearing only a few scattered hairs, mostly along inner surfaces. Tarsi all five segmented, with all segments short and broad. Abdomen with large, bilobed, common excavation of first two sternites filled with mass of hyaline material, first sternite with row of punctures bearing long, golden hairs directed posteriorly, ventral to hyaline mass. Aedeagus consisting of basal piece, parameres, and penis, together more or less cylindrical, not flat, though parameres and penis occasionally so, basal piece curved or bent dorsoventrally and longer than parameres.

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[1] D'Orchymont (for example 1926, p. 242, 1928, p. 89) considered the antennae to be nine segmented, but I have examined slide mounted specimens of *C. seminulum* and of several New World species and have counted only eight segments in each. Hrbáček (1948, 1950) illustrated the antennae of *seminulum* as clearly eight segmented, although the genus is mislabeled in the 1950 paper due to a scrambled caption for the figure. The confusion seems to lie in the area between the globular second segment and the club, where I count only three segments.

SPECIES GROUPS AND PHYLOGENY

Phylogenetic speculation on the basis of as few characters as are currently available in *Chaetarthria* is both difficult and dangerous. Nevertheless the present study has given some information which can be used to divide the New World species of the genus into groups and to erect a provisional, partial phylogeny. I hope that other workers will search for additional characters and examine additional species from other areas, to test the system here presented. Two areas which might yield valuable information are the detailed study of slide mounted adult mouthparts and the study of the morphology of immature stages (almost none of which are yet known). Dr. Lee Herman, of the American Museum of Natural History, New York, and I have examined slide mounted females of several species for the spermatheca, since this character has proved valuable in the study of the phylogeny of other Coleoptera (see for example Herman, 1972, on *Bledius*) but have been unable to find any discrete sclerotized structure.

Currently a controversy is raging as to whether all classifications must be strictly phylogenetic in the sense of Hennig (1966). I do not believe that they must be, since a classification is not, *per se*, a phylogeny. A classification and a phylogeny each convey specific, different types of information. A phylogenetic diagram is particularly concerned with the time sequence in which groups of organisms diverged from each other, while a classification is more useful if it is allowed to reflect the degree and importance of changes along a particular phylogenetic line. Thus we may separate off into a separate taxon a group of species which share some particular evolutionary advancement even though the resultant taxon is not strictly a "sister group" of another taxon at the same level. My view is quite similar to that of Ashlock (1971, 1973), who would accept both taxa which are strictly monophyletic (i.e. which include all the descendants of a common ancestor; he calls this holophyly) and taxa which are paraphyletic (i.e. which include part but not all of the descendants of a common ancestor *which had those apomorphic characters which unite the taxon*). This question has been repeatedly discussed in the literature, particularly in the pages of *Systematic Zoology* (see for example Nelson, 1971, 1973, and Colless, 1972).

The species treated in this study are divided into five species groups. The *nigrella* group is monophyletic because it contains only one species. The *bicolor* group is probably monophyletic because it contains all species which have bristles on the male metasternum, and the *atra* group is probably monophyletic because it contains all species with flat plates on the male protibiae. Neither of these characters is likely to have evolved twice, so the *bicolor* and *atra* groups are probably not polyphyletic.

The *spangleri* group is probably paraphyletic, since it contains part but not all of the species with stalked discs on the male protibiae. This character probably evolved only once, so the *spangleri* group is not likely to be polyphyletic, but since the members of the *bicolor* group also have these discs, the *spangleri* group is probably not strictly monophyletic.

Members of the *glabra* group have no synapomorphic characters except those of the genus as a whole. Thus this group appears to be paraphyletic, since it is not likely that the generic characters evolved more than once.

In order to determine which characters are apomorphic and which are plesiomorphic in New World *Chaetarthria* several Old World species of the genus and of the closely related genus *Thysanarthria* were examined, as follows: 1) *C. seminulum* Herbst, from Europe 2) *C. indica* d'Orchymont, from India 3) a species from the Philippines which is very similar to *indica*, differing only in the apices of the parameres, and may not be specifically distinct 4) two probably undescribed species of *Thysanarthria* from Ceylon. The characters of these species are presented in tabular form below.

Character	*Thysanarthria*, two species	*C. indica* and species near it	*C. seminulum*	Probable plesiomorphic state, new world *Chaetarthria*.
Male protibiae	Unmodified	Unmodified	Unmodified	Unmodified
Color, head	Black	Reddish brown	Black	?
Color, pronotum and elytra	Yellow brown	Reddish brown	Dark reddish brown	?
Pubescence of elytra	Fairly strong	Nearly glabrous	Nearly glabrous	? Nearly glabrous
Punctation of elytra	Fairly strong	Almost none	Strong and even	?
Elytral striae	Ten striae on each elytron	Sutural striae only	Sutural striae only	? Sutural striae only
Proportions of parameres	Longer than wide	Longer than wide	Wider than long	?
Metasternal bristles, males	Absent	Absent	Absent	Absent

The only one of the above characters which seems useful for phylogenetic speculation is the condition of the male protibiae; the presence of an elbowed inner margin and/or the presence of plates or discs apparently represent advancements over the primitive condition for the New World species of the genus. The presence of larger bristles on the male metasternum also seems to be an apomorphic character which defines a monophyletic species group of New World species, the *bicolor* group.

It is not known where *Chaetarthria* originated or how many phylogenetic lines within the genus have spread to the New World. However since neither *Thysanarthria* or *Hemisphaera*, the closest relatives of *Chaetarthria*, occur in the New World I will assume that the genus originated outside the New World and, further, assume that the genus invaded the New World only once. The only reason for the latter assumption is that it simplifies the phylogeny by allowing me to leave out species from outside the geographic area under consideration; study of the fauna worldwide may show that this is incorrect and force interpolation of Old World species into the family tree.

The hypothetical ancestral New World chaetarthrian, then, probably lacked any modification of the male protibiae or metasternum, and, less reliably, may have been a beetle which was nearly glabrous dorsally and lacked any striae or apical grooves on the elytra except the sutural stria. The members of the *glabra* group fit this criterion except that *C. truncata* has apical elytral grooves, and this group seems to be the most primitive in the New World. Additional characters which they possess include a brown to blackish dorsum, with the head in some species not darker than the rest of the dorsum (in all other New World species the head is black), and the rather flat parameres together forming nearly a square. The members of this group are from Central America and Mexico except *C. truncata* from California. It is possible that the genus may have entered the New World via the Bering Strait, undergone an initial radiation in western North America, and then been pushed south to Mexico and Central America by the Pleistocene glaciations, with *C. truncata* representing a species which avoided the glaciers by restricting itself to high altitude refugia instead of southward migration. There is little hard evidence to support this historical view, but it is certainly a fairly common sort of evolutionary history among organisms of western North America. From the few characters available to work with, I am unable to speculate further as to relationships of the species within the *glabra* group.

In figure 1 the proposed phylogeny is presented and the evolutionary advancements are shown as numbers. Thus number 1 represents the development, in the *nigrella* group and all further groups, of the elbow on the inner margin of the male protibia. In *C. nigrella*, the only member of its group, the inner face of the apical portion of the male protibia is provided with a single enlarged, flat spine. These changes probably represent the initial evolution of a "no slip" device to facilitate mating, which has been further refined in the remaining groups. *C. nigrella* occupies the western United States, and probably extends into Mexico.

From the *nigrella*-like condition the male protibiae appear to have been further modified in two different directions, one line developing a series of flat, slanting plates on the inner face and the other developing a series of stalked discs in the same area. I can not determine whether one of these conditions evolved from the other or whether each developed separately from the *nigrella*-like condition.

The line which developed plates on the male protibia (3, figure 1) is the *atra* group, which also appears to have originated in North America and has subsequently invaded South America. Within the group there seem to be two subgroups of closely related species, and several species that are loosely related to one or the other of the subgroups. The first of the subgroups consists of *C. atra*, *atroides*, *hespera*, *spinata* and *leechi*. All are dorsally dark colored and have the parameres more or less elongate, parallel sided, and split into dorsal and ventral sclerotized plates separated by lateral membranous regions (4, figure 1)[1]. Since these species approximately replace each other geographically throughout the United States (and probably northern Mexico), they may have evolved by geographic speciation from a single widespread species. *C. leechi*, however, differs enough in the structure of the aedeagus that it may be more distantly related to the others.

C. pusilla is similar to the above group of species but is much smaller and has the parameres and penis much reduced in relation to the basal piece although still constructed on the same general plan (5, figure 1). This species extends throughout much of western North America and all of Central America, and shows geographic variation. Thus it may be a sister group to the above group of species.

C. brasilia, from Brazil, and *C. lateralis*, from Chile, may also be related to this subgroup, representing one or two invasions by it into South America, but they do not have an aedeagus built on the general plan described above. It is also possible that they are members

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[1] This character of being laterally membranous appears, however, in several other species in other groups.

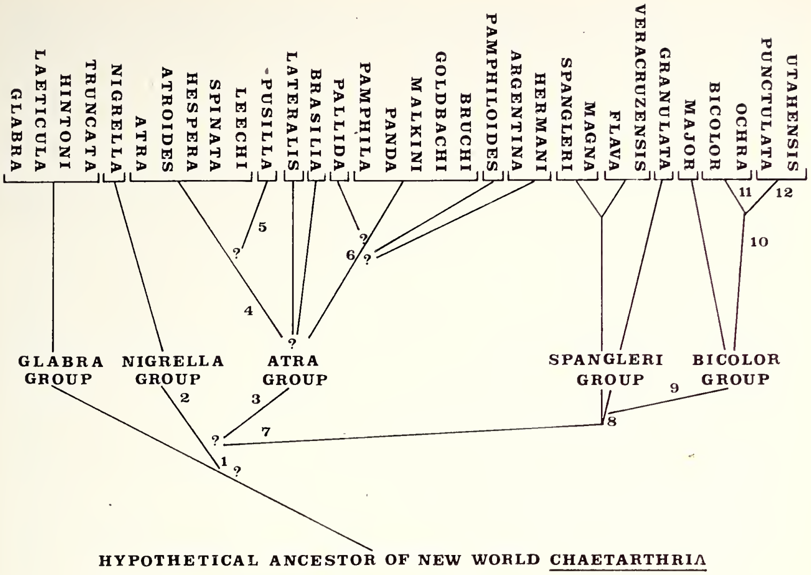

FIG. 1. Proposed phylogeny of new world *Chaetarthria*. Numbers refer to the occurrence of morphological changes, as follows: 1. Male protibiae elbowed; 2. Male protibiae with single large spine; 3. Male protibiae with slanting plates; 4. Parameres largely membranous laterally; 5. Parameres reduced, basal piece elongated; 6. Parameres largely membranous dorsally; 7. Male protibiae with stalked discs; 8. Discs of male protibiae reduced to two; 9. Male metasternum with larger, yellow bristles; 10. Discs of male protibiae reduced to one; 11. Parameres wing shaped; 12. Parameres unequal.

of the following subgroup which have become dorsally dark colored; at the present time I consider their affinities to be very uncertain.

The second subgroup within the *atra* group is entirely South American except for *C. pallida*. *C. pamphila*, *argentina*, *pamphiloides*, *panda*, *malkini*, *goldbachi*, *bruchi*, and *pallida* are all dorsally yellow to brownish yellow and are so similar that they appear closely related. Little can be said of relationships between them except that *pallida*, *pamphila*, *panda*, and *malkini* all have the center of the dorsal surface of each paramere largely membranous (6, figure 1). *C. goldbachi* is similar but has smaller membranous areas. *C. hermani* is dark brown dorsally but is obviously close to *argentina* since the aedeagus of these two species differs only in proportions.

C. pallida might have diverged from the remaining species of its subgroup prior to the entrance of the subgroup into South America. I consider it more likely that the species reinvaded North America, is now undergoing geographic differentiation, and may eventually become a group of three species.[2]

The other modification of the male protibia is the development of discs on short stalks on the apical portion (7, figure 1). This is shown by the *spangleri* and *bicolor* groups. In the *spangleri* group there are from two to five such discs on each protibia, and in the *bicolor* group there are only one or two discs on each protibia.

The *spangleri* group consists of four species in southern North America to Central America, and one, *C. granulata,* in Brazil. The group probably originated in North or Central America with *granulata* representing an invasion of South America. Among the remaining species of the group, *C. spangleri* and *magna* are similar in having a large aedeagus with the parameres separated at the tips, but the proportions of the aedeagus are quite different. On the other hand *flava* and *veracruzensis* are probably very closely related as they have a very similar aedeagus and appear to replace each other geographically. The final species of the group, *granulata*, has two male protibial discs (8, figure 1) but is placed in the *spangleri* group because it lacks the metasternal bristles which define the *bicolor* group (9, figure 1).

Finally, in addition to the metasternal bristles the *bicolor* group all have two discs on each protibia (*C. major*) or only one (10, figure 1). Among the four species with single discs, *bicolor* and *ochra* appear closely related because of their wing shaped parameres, and *punctulata* and *utahensis* appear closely related because both have unequal parameres. All known members of the *bicolor* group are from North or Central America.

It should be emphasized that the above scheme is highly speculative. In some cases I have had to select from nearly equally likely possibilities, but I have tried to point out the uncertainties in each case. Finally, it is interesting that these beetles appear never to have invaded the West Indies; no specimens are known from any of those islands.

KEY TO THE NEW WORLD SPECIES OF CHAETARTHRIA

The species of *Chaetarthria* found in the New World are difficult to identify without reference to the aedeagus. It is recommended that all determinations made with this key be checked carefully against the diagnosis and the figures of the protibia and aedeagus. Females taken unaccompanied by males should be considered only tentatively identified except for those few species in which the females have distinctive characters.

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[2] It could be argued that this speciation has already occurred; see further discussion under *C. pallida*.

1. From North or Central America 2
From South America 40

2(1). Protibiae elbowed or rounded on inner margin and/or with one or more flat plates on medial or posterior face of apical portion (figs. 15, 19 to 21, etc.) (males) 3
Protibiae with sides evenly divergent from base to apex, lacking special plates or discs (figs. 4, 5) (females, some males) .. 19

3(2). Medial face of apical portion of protibiae with single large, flat spine (fig. 15); elbow of protibia slightly distad of middle; dorsum black to dark reddish brown, sometimes with vaguely to clearly defined pale border on sides and elytral apex; head and pronotum micropunctate (sometimes very faintly); elytra usually 1.4 to 1.6 mm. long; western North America .... *nigrella* (LeConte)
Medial face of apical portion of protibiae with plates or discs (figs. 20, 80, 99, etc.) 4

4(3). Apical portion of protibiae with series of flat, slanting plates (fig. 20, etc.) 5
Apical portion of protibiae with one or more stalked discs (figs. 80, 99, etc.) 11

5(4). Dorsum yellow or brownish yellow, except head black; protibiae elbowed near middle with three plates on apical portion; elytra usually 1.1 to 1.6 mm. long; widespread in North America .... *pallida* (LeConte)
Dorsum black to reddish brown 6

6(5). Elytra generally 1.1 to 1.3 mm. long; protibiae elbowed at about basal third, apical portion with five or six plates; northern California to Costa Rica, east to Texas .... *pusilla* Sharp
Elytra usually over 1.5 mm. long 7

7(6). Protibiae elbowed at about basal quarter (fig. 19), apical portion with nine to eleven plates (fig. 20); eastern United States and Canada, west to about central Oklahoma, Kansas and Nebraska .... *atra* (LeConte)
Protibiae elbowed beyond basal quarter (fig. 21, etc.) 8

8(7). Mesofemur with broad, shallow tooth on posterior margin (fig. 29); protibiae elbowed slightly proximad of middle (fig. 30), apical portion with ten to thirteen plates, elytra usually 1.7 to 2.1 mm. long; central California near coast .... *spinata*, new species
Mesofemur not toothed 9

9(8). Protibiae elbowed at about basal third, apical portion with eight or nine plates; elytra usually 1.8 to 2.1 mm. long; Trinity County, California .... *leechi*, new species

Protibiae elbowed beyond basal third 10

10(9). Elytral apex slightly attenuate, with clearly defined pale border at sides of pronotum and elytra and about apical quarter of elytra; protibiae elbowed just proximad of middle (fig. 21), with seven or eight plates on apical portion; elytra usually 1.8 to 2.0 mm. long; central Texas to Nebraska .... *atroides*, new species

Elytral apex not attenuate, without clearly defined pale border; protibiae elbowed at about middle (fig. 27), apical portion usually with five plates (fig. 28), occasionally six or seven; elytra usually 1.5 to 1.7 mm. long; southwestern United States .... *hespera*, new species

11(4). Apical portion of protibia with single small, stalked disc near apex (figs. 99, 103) 12

Apical portion of protibia with two or more stalked discs (figs. 80, 92) 15

12(11). Dorsal surface, except head, yellowish without darker clouding or markings except elytral humeri and scutellum often marked with brown; protibiae rounded at about apical fifth, not sharply elbowed (fig. 104), disc somewhat proximad of apex (fig. 103); metasternum usually with double row of larger, yellowish bristles in posterior quarter; elytra usually 1.6 to 1.8 mm. long; central California to northern Mexico, east to Arizona .... *ochra*, new species

Dorsal surface, except head, reddish brown or, if yellowish, pronotal disc usually clouded with brown; metasternum always with double row of larger, yellowish bristles in posterior quarter, sometimes hard to see 13

13(12). Protibiae slightly sinuate on inner margin, not sharply elbowed (fig. 100), disc very near apex (fig. 99); dorsum yellow to nearly black, if very dark elytral apex with several deep, short, longitudinal grooves and pronotum with narrow, clearly defined pale border; elytra usually 1.3 to 1.6 mm. long; northern California to Costa Rica, east to central Texas .. *bicolor* Sharp

Protibiae sharply elbowed on inner margin (fig. 110); dorsum, except head, reddish brown to nearly black 14

14(13). Elytra usually 1.5 to 1.7 mm. long; protibiae elbowed at about middle (fig. 110); Utah .... *utahensis*, new species

Elytra usually 1.3 to 1.5 mm. long; protibiae elbowed between middle and apical third (variable); southern California to central Mexico, east to Texas .... *punctulata* Sharp

15(11). Protibiae rounded at about apical fifth, not sharply elbowed, with two discs near apex (figs. 91, 92); dorsum, except head, dark reddish brown to nearly black; metasternum with double row of larger, yellowish bristles in posterior quarter; elytra usually 1.6 to 1.8 mm. long; central Mexico (Sinaloa) to Honduras .... *major*, new species

Protibiae fairly sharply elbowed before apical fifth, with three or more discs on apical portion (figs. 79, 80) 16

16(15). Protibiae with three discs on apical portion, elbowed somewhat distad of middle; dorsum slightly brownish yellow, except head; elytra usually 1.4 to 1.5 mm. long; Veracruz State, Mexico .... *veracruzensis*, new species

Protibiae with four or five discs on apical portion 17

17(16). Dorsum, except head, dark reddish brown to nearly black; protibiae elbowed just distad of middle, with four discs on apical portion (figs. 79, 80); elytra usually 1.7 to 1.9 mm. long; southern California and Arizona to northern Mexico .... *magna*, new species

Dorsum yellowish, or specimen from south of Mexico 18

18(17). From Sonora or Sinaloa, Mexico; dorsum, except head, yellow without brown shading or marking on pronotum; protibiae elbowed at about apical third, apical portion with four discs, elytra usually 1.4 to 1.7 mm. long .... *flava*, new species

From southern Mexico or Central America; dorsum, except head, yellow often marked with brown on pronotum, to brown; protibiae elbowed at about middle (fig. 73), apical portion with four or five discs; elytra usually 1.5 to 1.7 mm. long .... *spangleri*, new species

19(2). Dorsum entirely smooth and shining, almost completely without punctures or vestiture; dorsum including head reddish brown; rather strongly convex beetles, greatest height/elytral length usually over .7; elytra usually 1.0 to 1.1 mm. long; Panama to Nicaragua (males and females) .... *glabra* Sharp

Dorsum with at least some fairly evident punctation and vestiture seen under good magnification, particularly on elytra; greatest height/elytral length usually under .6 20

20(19). Elytral apex with several short, deep striae; dorsum mostly blackish 21

Elytral apex without deep striae except sutural, although sometimes with shallow grooves or slightly raised areas 22

21(20). Head and pronotum strongly micropunctate; elytral apex broadly and sharply paler; elytra usually 1.3 to 1.5 long; central California (males and females) .... *truncata*, new species

Head and pronotum lacking micropunctation; elytra sharply but narrowly paler at sides and apex; elytra usually 1.3 to 1.5 mm. long; central California (females) .... (in part) *bicolor* Sharp

22(20). From east of line drawn through central Oklahoma, Kansas, and Nebraska; dorsum largely reddish brown, elytral apex often diffusely paler; elytra usually 1.6 to 1.8 mm. long (females) .... *atra* (LeConte)

From west of such line or south of Oklahoma, or dorsum mostly yellowish 23

23(22). Dorsum, except head, dark brown to black, often with diffuse to distinct pale border; pronotum lightly micropunctate; elytra usually 1.4 to 1.6 mm. long; western North America (females) .... *nigrella* (LeConte)

Dorsum largely yellowish, or pronotum not micropunctate, or elytra usually over 1.7 mm. long 24

24(23). Elytra usually under 1.3 mm. long[1]; dorsum, except head, dark brown 25

Elytra usually over 1.3 mm. long or dorsum largely yellowish (females) 27

25(24). Narrower, less convex beetles, greatest width/elytral length usually under .86, greatest height/elytral length usually under .56; dorsum, except head, usually dark reddish brown, head black; elytra usually 0.9 to 1.3 mm. long; central California to Costa Rica, east to Texas (females) .... *pusilla* Sharp

Broader, more convex beetles, greatest width/elytral length usually over .86, greatest height/elytral length usually over .56; dorsum mostly brown to reddish brown 26

26(25). Elytral punctation fairly evident; dorsum, including head, shining light brown to fairly dark brown; elytra usually about 1.1 mm. long; Mexico State, Mexico (males and females) .... *hintoni*, new species

Elytral punctation shallow, not very evident; dorsum reddish brown except head sometimes black; elytra usually 1.0 to 1.1 mm. long; Guatemala and Panama (males and females) .... *laeticula* Sharp

27(24). Dorsum reddish brown to black; western United States or northern Mexico 28

Dorsum lighter than reddish brown or not from western United States or northern Mexico 34

28(27). Pronotum and elytra with definite pale border including about apical quarter of elytra; elytra usually 1.7 to 1.9 mm. long; central Texas to Nebraska .... *atroides*, new species

Pronotum and elytra usually at most diffusely paler at sides and apex 29

29(28). Dorsum, except head, brownish black, diffusely paler at elytral apex and sides of pronotum; elytra about 2.0 mm. long; Trinity Co., California .... *leechi*, new species

Dorsum, except head, reddish brown, not usually blackish, or elytra less than 1.5 mm. long 30

30(29). Smaller beetles, elytra usually 1.3 to 1.5 mm. long; dorsum reddish brown to nearly blackish; southern California to Mexico and Veracruz States, Mexico, east to Texas .... *punctulata* Sharp

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[1] The smallest specimens of *C. punctulata* incorrectly key here and can not be separated from *pusilla*; they differ from *laeticula* by their stronger punctation and from *hintoni* by their black heads.

Larger beetles, elytra usually over 1.5 mm. long 31

31(30). Utah; pronotum and elytra fairly light reddish brown; elytra of male 1.5 to 1.7 mm. long, but female unknown .... *utahensis*, new species

West or south of Utah, or elytra and pronotum darker than light reddish brown 32

32(31). Smaller beetles, elytra usually under 1.75 mm. long[2]; pronotum never with micropunctation; southwestern United States north to central California and east to Oklahoma, and probably in northern Mexico .... *hespera*, new species

Larger beetles, elytra usually over 1.75 mm. long 33

33(32). Pronotum very lightly micropunctate, this micropunctation sometimes very hard to see; dorsum, except head, dark brown with pronotum yellowish laterally, elytra usually not diffusely paler apically; elytra usually 1.7 to 1.9 mm. long; Sonoma and possibly Mendocino Counties, California, near coast .... *spinata*, new species

Pronotum not micropunctate; dorsum, except head, reddish brown to nearly black, elytra usually diffusely paler apically; elytra usually 1.7 to 2.1 mm. long; southern California and Arizona to northern Mexico .... *magna*, new species

34(27). Dorsum, except head, shining dark reddish brown[3]; elytra usually 1.7 to 2.0 mm. long; central Mexico (Sinaloa) to Honduras .... *major*, new species

Dorsum, except head, yellow to yellowish brown 35

35(34). Smaller beetles, elytra usually under 1.45 mm. long[4], or from central or eastern United States; pronotum sometimes micropunctate 36

Larger beetles, elytra usually over 1.45 mm. long; pronotum never micropunctate; western United States or Mexico to Central America 37

36(35). Dorsum, except head, yellowish with pronotum often clouded with brown and darker than elytral disc; specimens from central to northeastern United States micropunctate on pronotum; elytra usually 1.2 to 1.5 mm. long; widespread in North America .... *pallida* (LeConte)

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[2] The largest *C. hespera* and the smallest *spinata* and *magna* will key incorrectly using this character; *spinata* can usually be distinguished by its very lightly micropunctate pronotum but females of *hespera* and *magna* seem to differ only in average size.

[3] The dark Costa Rica populations of *C. spangleri* key here but the dorsum is less shining and the elytra are under 1.7 mm. long.

[4] Extremely small specimens of several species and extremely large specimens of others key incorrectly here, so that if size is used at this point, the diagnosis should be carefully checked after a determination is reached.

Dorsum, except head, yellow to yellowish brown, pronotum sometimes clouded with brown but not usually darker than elytral disc; pronotum never micropunctate; elytra usually 1.2 to 1.6 mm. long; California west of Sierra Nevada Mountains to Costa Rica, east through southern California to Texas .... *bicolor* Sharp

37(35). Dorsum, except head, pale, without darker shading or marking except scutellum and humeri often marked with brown; elytra usually 1.7 to 1.9 mm. long; central California to Sonora, Mexico, east to Arizona .... *ochra*, new species

Dorsum, except head, darker yellow to brown, often clouded or marked with brown; Sonora or south of Sonora 38

38(37). Sonora and Sinaloa, Mexico; dorsum, except head, yellow, not marked with brown; elytra usually 1.5 to 1.8 mm. long .... *flava*, new species

South of Sinaloa, Mexico; dorsum, except head, almost always brownish or with brown markings 39

39(38). Veracruz State, Mexico; dorsum, except head, slightly brownish yellow; elytra usually 1.5 to 1.6 mm. long .... *veracruzensis*, new species

Mexico south of Veracruz, to Costa Rica; dorsum, except head, yellow to brown; elytra usually 1.4 to 1.7 mm. long .... *spangleri*, new species

40(1). Very small beetles, elytra usually under 1.3 mm. long; dorsum dark brown to nearly black 41

Larger beetles, elytra usually over 1.3 mm. long, or dorsum, except head, yellowish 42

41(40). Dorsum, except head, shining dark reddish brown except diffusely paler at sides and apex; nearly glabrous; elytra usually 1.1 to 1.3 mm. long; Matto Grosso, Brazil .... *brasilia*, new species

Dorsum, except head, reddish brown except pronotal disc and scutellum blackish; head and pronotum dull and granulate appearing, micropunctate; vestiture evident and regularly arranged; elytra usually 0.9 to 1.1 mm. long; Matto Grosso, Brazil .... *granulata*, new species

42(40). Dorsum blackish except sides and elytral apex sharply paler; elytral apex slightly attenuate and bent sharply down so nearly perpendicular to venter; elytra usually 1.6 to 1.7 mm. long; Cautín, Chile .... *lateralis*, new species

Dorsum, except head, yellow to dark brown, never with distinct pale margins and never with elytra bent sharply down at apex .... 43[5]

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[5] Females are difficult to identify past this point in the key.

43(42). Dorsum, except head, dark brown; male protibiae with four plates; elytra usually 1.2 to 1.5 mm. long; Tucumán and La Rioja Provinces, Argentina .... *hermani*, new species

Dorsum, except head, brown to yellow, male protibiae usually with five or more plates 44

44(43). Dorsum, except head, light to fairly dark brown; male protibiae usually with five plates; elytra usually 1.3 to 1.7 mm. long; Tucumán Province, Argentina .... *argentina*, new species

Dorsum, except head, brownish yellow to pale yellow; male protibiae usually with five or more plates 45

45(44). Elytral vestiture evident under oblique lighting, made of flat hairs nearly half as broad as long; male protibiae usually with five plates; elytra usually 1.1 to 1.3 mm. long; Matto Grosso, Brazil .... *pamphila* d'Orchymont

Elytral vestiture sparser and less evident, individual hairs less than a third as broad as long; male protibiae with more than five plates .... 46[6]

46(45). Males with central portion of each paramere a soft, dull appearing membrane with reticulate surface, often becoming somewhat deformed on drying (figs. 59, 63, etc.) 47

Males with central area of each paramere smooth, slightly shining, not deformed on drying (figs. 69, 71) 49

47(46). Males with apex of each paramere slender, elongate (fig. 59); protibiae with six or seven plates; elytra usually 1.1 to 1.4 mm. long; Paraguay, Goias, Brazil and possibly Alagoas, Brazil .... *pamphiloides* d'Orchymont

Males with apex of each paramere broad, not elongate (fig. 63, etc.) 48

48(47). Parameres about .22 mm. long; male protibiae elbowed at about basal third, with six to nine plates; elytra usually 1.2 to 1.4 mm. long; pronotum not micropunctate; Matto Grosso and Goias, Brazil, and Venezuela .... *malkini*, new species

Parameres .26 to .39 mm. long; male protibiae elbowed at about middle, with seven to nine plates; elytra usually 1.5 to 1.7 mm. long; pronotum sometimes micropunctate; Tucumán, Argentina to Matto Grosso, Brazil, and probably also Uruguay and Peru .... *panda* d'Orchymont

49(46). Apex of each paramere obliquely truncate (fig. 71); male protibiae usually with six or seven plates; elytra usually 1.5 to 1.7 mm. long; Tucumán and Cordoba, Argentina .... *bruchi* Balfour-Browne

Apex of each paramere elongate, rounded at tip, with small bump on medial margin (fig. 69); male protibiae usually with seven to ten plates; elytra usually 1.2 to 1.7 mm. long (in

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[6] Females can not be keyed beyond this point.

Argentina 1.5 to 1.7, in Brazil 1.2 to 1.5); Matto Grosso and Goias, Brazil, Tucumán, Argentina, and Venezuela .... *goldbachi*, new species

DESCRIPTIONS OF SPECIES

THE GLABRA GROUP

DIAGNOSIS: Dorsal surface brown to black, head colored as rest of dorsum in some species, black in others; protibiae of males not elbowed and without apical bulge on inner margin (fig. 4), and lacking special armature on inner face; male metasternum without larger bristles; parameres together forming nearly a square (fig. 2, etc.).

This group of four species occurs primarily in central Mexico to Central America with one species in central California. Because of the lack of modifications of the male protibiae, it appears to be the most primitive group in the New World.

Chaetarthria glabra Sharp

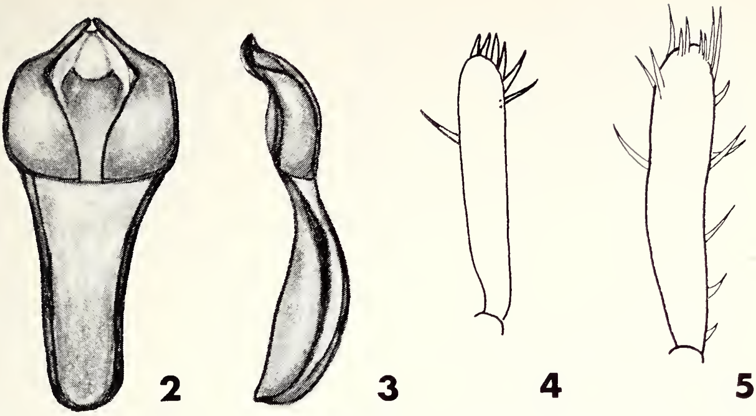
(Figures 2, 3, 4, 5, 6)

Chaetarthria glabra Sharp, 1882, p. 87. Type locality: Chontales, Nicaragua. Type male and two female paratopotypes in British Museum (Natural History). Type examined by Mr. Harry Kenward and paratopotypes by me for this study. Sharp, 1887, p. 768.

DIAGNOSIS: The dark reddish brown color of the dorsum including the head, with the shining, nearly impunctate and glabrous surface, and the convex shape when viewed from the side separate this species from all others. The aedeagus is also distinctive. Elytral length is generally from 1.0 to 1.2 mm.

DISTRIBUTION: Panama Canal Zone to Chontales district, Nicaragua.

MALE [based on specimen from Paraiso, Canal Zone, Panama, January 16, 1911, E. A. Schwarz (DM)]: Shape nearly circular, very convex. Dorsal surface entirely dark reddish brown, including head, smooth and shining, almost completely impunctate and glabrous except labrum with many small punctures, elytral apex lacking grooves or raised areas. Ventral surface yellowish brown with maxillary palpi and antennae except club more yellowish. Legs each with one or two particularly long spines on inner margin of tibiae but lacking secondary sexual modifications. Aedeagus in dorsal view with parameres broad, together forming nearly a square with a short point at center of apical side, inner margins strongly divergent to near apex, then strongly convergent to tip; penis exposed between parameres,



FIGS. 2–5. Fig. 2. *Chaetarthria glabra*, aedeagus, dorsal. Fig. 3. same, lateral. Fig. 4. same, left protibia, anterior face. Fig. 5. same, left mesotibia, anterior face.

broadly triangular, tip elongate and broadly emarginate dorsally at apex; basal piece elongate, widest at junction with parameres, rounded at base; in lateral view basal piece slightly curved, if straightened out would be about one and one-half times length of parameres; parameres with dorsal margin curving ventrally from base, flattened at tip.

FEMALE [based on specimen with data as male above (USNM)]: Externally identical to male, including tibiae.

VARIATION: No appreciable variation is present in the specimens I have seen, but Mr. Kenward reports that the type has the pronotum "dark yellowish brown" and the rest of the dorsum "near black." See also "Species A" in "Specimens of Uncertain Placement."

SPECIMENS EXAMINED: 22 males, 22 females. COSTA RICA: *Puntarenas*: Rincon de Osa, July. NICARAGUA: *Chontales*: No further data. PANAMA: *Archipielago de las Perlas*: San Miguel. *Canal Zone*: Bohio, February, April. Paraiso, January, April. *Panama*: Madden Lake, near dam, February, damp leaves and debris in stream bed.

Chaetarthria hintoni, new species

(Figures 6, 7, 8)

DIAGNOSIS: The brown coloration of the dorsum including the head, together with definite elytral punctation, distinguish this species from all others in the New World except *laeticula* Sharp; this latter species has the elytral punctation somewhat less definite than *hintoni*.

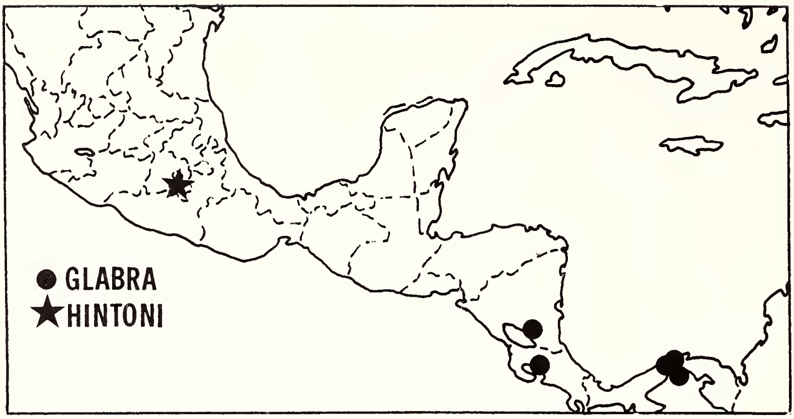


FIG. 6. Distribution of *Chaetarthria glabra* and *C. hintoni.*

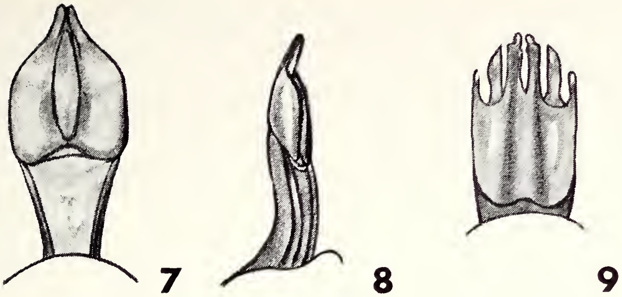
Because these two species are quite similar examination of the aedeagus is recomemnded. Elytral length is generally 1.1 to 1.2 mm.

DISTRIBUTION: Known only from Tejupilco, Temescaltepec, Mexico state, Mexico.

HOLOTYPE: Male, Tejupilco, Temescaltepec, Mexico state, Mexico, June 18, 1933, H. E. Hinton, R. L. Usinger (BM). Shape broadly oval and rather convex. Dorsal surface entirely light brown, shining, head very finely and sparsely punctate, except labrum more closely so, pronotum like head, elytra with somewhat coarser and thicker punctation becoming subserial apically, alternate irregular rows of punctures bearing very fine hairs. Ventral surface light reddish brown, antennal club slightly darker. Legs without secondary sexual modifications, protibiae with one slightly longer spine on inner margin. Aedeagus in dorsal view broad and flat, parameres broad, considerably attenuated along inner margin at tip; basal piece elongate, margins somewhat concave, widest at junction with parameres; in lateral view basal piece slightly curved, if straightened out would be about one and one-half times length of parameres; parameres convex ventrally, apical third much thinner. EL 1.09 mm., GW .96 mm., GH .62 mm., PL .18 mm., GW/EL .89, GH/EL .58.

ALLOTYPE: Female, same data as holotype (BM). Externally like holotype, including tibiae. EL 1.14 mm., GW .98 mm., GH .67 mm., GW/EL .86, GH/EL .58, PL .18 mm.

VARIATION: A single female (BM), with data identical to the other specimens of *hintoni*, has the head and elytra considerably darker and the pronotum slightly darker than in the other specimens.



FIGS. 7–9. Fig. 7. *Chaetarthria hintoni*, aedeagus, dorsal. Fig. 8. same, lateral. Fig. 9. *C. laeticula*, aedeagus, dorsal.

It also has a fairly sharply defined pale border occupying the apical quarter of the elytra and slanting forward along the sides. All other characteristics are typical of *hintoni*. This specimen may represent a distinct species, and has been labeled as a manuscript species by Mr. J. Balfour-Browne, but since color variation parallel to this can apparently occur in other species of the genus (see *nigrella* (LeC.) and *bicolor* Sharp, for example) I have labeled this specimen "? *hintoni*" pending the discovery of males with this coloration. The specimen is excluded from the paratypes.

PARATYPES: 1♂, 2♀♀, same data as holotype (BM, DM).

Chaetarthria laeticula Sharp

(Figures 9, 10)

Chaetarthria laeticula Sharp, 1882, p. 87. Type locality: San Geronimo, Guatemala. Type female in British Museum (Natural History). Type examined by Mr. Harry Kenward and paratypes by me for this study. Sharp, 1887, p. 768.

DIAGNOSIS: The reddish brown dorsum and small size (elytral length generally 1.0 to 1.2 mm.) separate this species from all others in Central America except *hintoni*, which has stronger elytral punctation than *laeticula*. *C. glabra* Sharp is similar in size and color but lacks elytral punctation almost entirely. Examination of the aedeagus is recommended, as it is also distinct in having each paramere apically trifurcate. See also *pusilla* Sharp.

DISTRIBUTION: San Geronimo, Guatemala, and Archipielago de las Perlas, Panama, but see also "Variation."

MALE [based on paratype from San Geronimo, Guatemala, Champion, Biologia Centrali-Americana Collection (BM)]: Shape

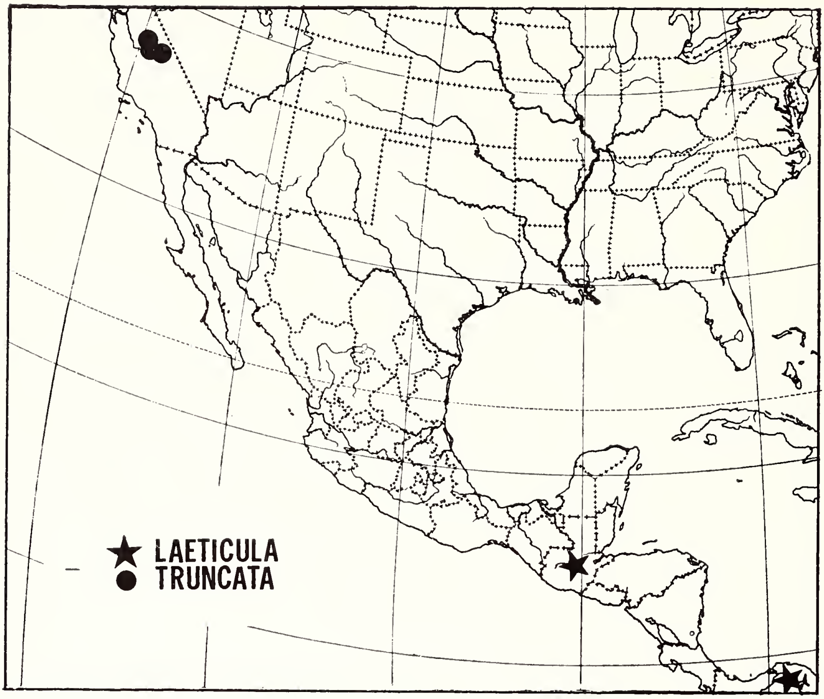


FIG. 10. Distribution of *Chaetarthria laeticula* and *C. truncata*.

broadly oval and fairly convex. Head black, nearly impunctate and glabrous. Pronotum, scutellum and elytra reddish brown, pronotum nearly impunctate and glabrous, elytra with shallow punctures distributed in vaguely subserial pattern with alternate, less regular rows bearing tiny, very difficult to see hairs. Ventral surface reddish brown. Legs without secondary sexual modifications. Aedeagus in dorsal view broad and flat, each paramere trifurcate at tip with lateral most branch narrow and thumb-like, next branch broader and blade-like, and inner branch with tiny elbow on lateral margin near apex; basal piece strongly tapered toward base of aedeagus; in lateral view basal piece narrowed at base, about half of length of entire aedeagus; parameres narrowed at tip.

FEMALE [based on paratype, data as male above (BM)]: Externally like male, including tibiae.

VARIATION: The pair from Pearl Islands, Panama are smaller than the Guatemalan paratypes and have the heads brownish, as in the other two species of the *glabra* group, rather than black as in the

Guatemalan *laeticula.* This suggests that they represent a separate species but the complex aedeagus is identical to that of the Guatemalan male, so I am retaining the material within a single species until enough material is available to make it possible to study geographic variation in some detail.

SPECIMENS EXAMINED: One male and one female paratype, plus one male and one female probably of this species. GUATEMALA: *Baja Verapaz*: San Geronimo. PANAMA: *Archipielago de las Perlas*: San Miguel.

Chaetarthria truncata, new species
(Figures 10, 11, 12)

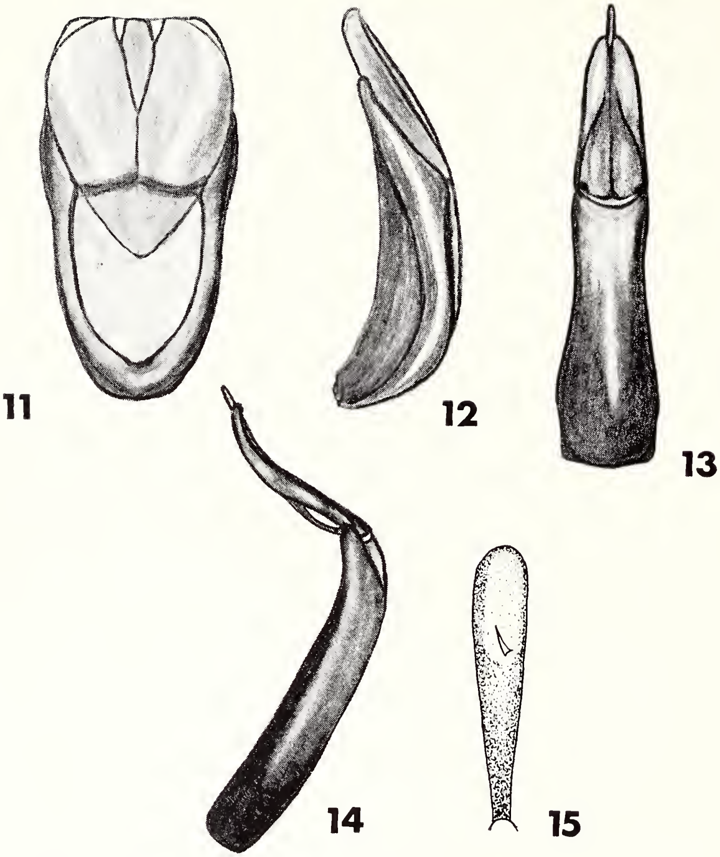
DIAGNOSIS: The combination of the strong micropunctation of the head and pronotum and the strong grooving of the elytral apex is unique among the known species. The elytral apex is pale, and the elytral length is generally 1.3 to 1.5 mm. This is the only species known north of Mexico in which the protibiae of the males lack secondary sexual modifications.

DISTRIBUTION: Central California, Fresno, Madera and Tulare counties.

HOLOTYPE: Male, Kings River, Route 180, Fresno County, California, August 23, 1950, P. S. Bartholomew (CA). Shape broadly oval and somewhat convex. Dorsal surface with head and pronotum black except sides of pronotum diffusely paler, both strongly micropunctate but without larger punctures; elytra black with sharply defined brownish yellow area at apex and extending about two thirds of the way anteriorly along sides, punctation of moderate strength, confused on disc but subserial laterally, apex strongly longitudinally grooved, no vestiture apparent, right elytron missing. Ventral surface blackish brown, antennae and palpi paler. Legs lacking sexual modifications or long spines. Aedeagus in dorsal view broad and flat, parameres broad, truncate, nearly rectangular; penis fairly slender, visible between parameres at tip; basal piece broad and short, approximately rectangular; in lateral view basal piece rather short and thick, extending as a shelf beneath most of paramere, including shelf about twice as long as paramere; paramere roughly triangular, dorsal margin slanting downward toward apex. EL 1.44 mm., GW 1.12 mm., GH .74 mm., GW/EL .78, GH/EL .51, PL .32 mm.

ALLOTYPE: Female, Kaweah, Tulare County, California, 1000 feet, no date, R. Hopping (CA). Externally identical to holotype, including legs, except punctation less regular at sides. EL 1.51 mm., GW 1.23 mm., GH .88 mm., GW/EL .80, GH/EL .58.

VARIATION: One paratype from Kings River, Fresno County



FIGS. 11–15. Fig. 11. *Chaetarthria truncata*, aedeagus, dorsal. Fig. 12. same, lateral. Fig. 13. *C. nigrella*, aedeagus, dorsal. Fig. 14. same, lateral. Fig. 15. protibia, medial face.

has a reddish brown pronotum and elytra, as compared with the black of the other specimens.

PARATYPES (total 10♂♂): UNITED STATES: *California*: FRESNO CO.: 2♂♂, data as holotype (CA, DM). MADERA CO.: 8♂♂, North Fork of San Joaquin River, at Sheep Crossing, 6000′, August 22, 1971, Hugh B. Leech (CA, DM).

THE NIGRELLA GROUP

DIAGNOSIS: Dorsal surface dark brown, sometimes with pale border on pronotum and elytra, head black; protibiae of males elbowed on inner margin and with single large, flat spine on medial surface of apical portion (fig. 15); male metasternum without larger bristles; parameres about twice as long as their combined width (fig. 13).

The single species which belongs to this group occurs throughout much of the western United States and into Canada. The sexual dimorphism of the protibiae, those of the male being elbowed, probably represents an advance over the previous group but *nigrella* lacks the further refinement of plates or discs on the male protibiae found in all the remaining groups.

Chaetarthria nigrella (LeConte)

(Figures 13, 14, 15, 16)

Cyllidium nigrellum LeConte, 1861, p. 342. Type locality: San Diego, California. Type male in Museum of Comparative Zoology, Harvard University (Lectotype, designated by Miller, McCorkle and Hatch, 1965, p. 46). Type reexamined by me for this study.

Chaetarthria nigrella: Horn, 1873, p. 125. Fall, 1901, pp. 12, 216. Leech and Chandler, 1956, p. 343. Miller, McCorkle and Hatch, 1965, p. 46.

DIAGNOSIS: Males may be recognized by either the aedeagus or the protibiae but the single large spine on the medial face of the protibia is not always easily seen so a male might be mistaken for a female. Females are similar to those of several other species but *nigrella* has the pronotum lightly micropunctate between the major punctures, while other species which may be confused with it are either strongly micropunctate (*truncata*) or lack micropunctation entirely (*punctulata*, *hespera*). Specimens of *nigrella* with a distinct pale border on the pronotum and elytra resemble *truncata* and *bicolor* in color pattern but both of these species have the elytral apex strongly grooved (at least in specimens with this color pattern) while *nigrella* does not. Size is also of some value in separating some specimens; elytral length measurements for the species noted above generally fall within the following ranges: *nigrella* 1.4 to 1.6 mm., *bicolor* 1.3 to 1.5 mm., *truncata* 1.3 to 1.5 mm., *hespera* 1.5 to 1.7 mm., *punctulata* 1.3 to 1.5 mm.

DISTRIBUTION: Western North America from southern British Columbia south to United States—Mexican border and east to central Montana and western Wyoming, in southern California apparently not extending east into or beyond the Mojave Desert.

MALE [based on lectotype, from California (MCZ)]: Shape oval, fairly convex. Head black, sparsely and very shallowly punctate,

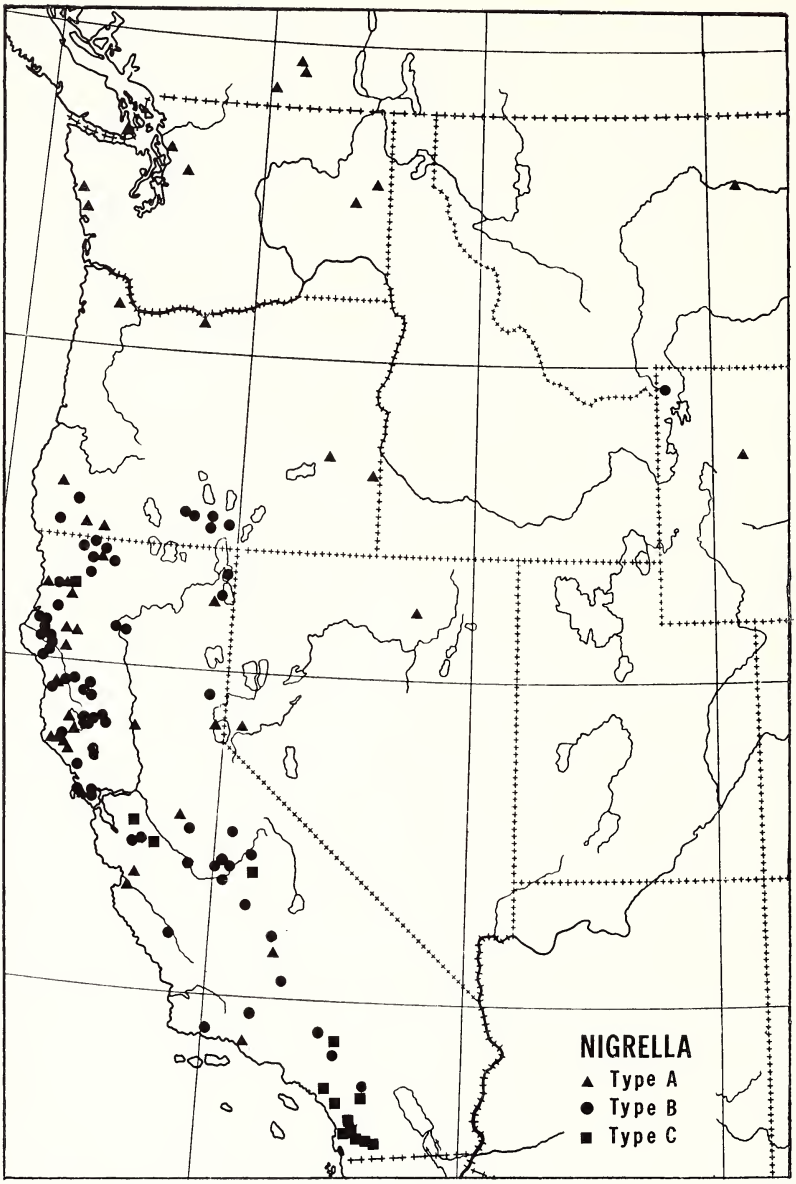


FIG. 16. Distribution of *Chaetarthria nigrella*. Type A, elytra without a definite pale border. Type B, pale border of elytra fairly broad but not sharply defined. Type C, pale border of elytra broad and sharply defined.

with only a few very fine hairs, labrum rather thickly but very finely punctate. Pronotum, scutellum and elytra entirely dark reddish brown except shading to yellowish brown at sides of pronotum and elytral apex, pronotum sparsely and very shallowly punctate with a few scattered, very fine hairs, lightly micropunctate between the major punctures in some areas, elytra fairly thickly but very shallowly punctate, punctures in alternate irregular and vaguely regular rows, irregular rows with a fine hair in each puncture. Ventral surface black, legs, palpi and antennae reddish brown. Protibiae widening sharply from base for about three-fifths of length, then very gradually narrowing to apex, about four times as long as greatest width, medial face of apical portion lacking plates or discs but with fairly large spine near the angle. Aedeagus in dorsal view with parameres sinuately convergent from base to tip, tip bluntly rounded; penis filiform; basal piece widening just back of juncture with parameres, then roughly parallel sided; in lateral view basal piece curved, about twice length of paramere; paramere slightly scoop-shaped near tip.

FEMALE [based on specimen from Pope Creek at Walter Springs road, Napa County, California, 520′, August 24, 1964, Hugh B. Leech (DM)]: Externally like male except palpi yellowish, legs and antennae lighter reddish brown, and lacking secondary sexual modifications of protibiae.

VARIATION: The micropunctation of the head and pronotum ranges from moderately strong (never as strong as in *truncata*) to very weak or even very rarely absent. Dorsal, ventral and appendage coloration vary from black to reddish brown, to yellow in the palpi.

Specimens from the mountains of Oregon and California usually have a poorly to sharply defined pale border that is narrow along the sides of the pronotum and the anterior quarter of the elytra and then broadening so that a wide portion of the elytral apex is pale. This border is most sharply defined in specimens from extreme southern California (San Diego, Riverside and Orange counties). See map, figure 16.

SPECIMENS EXAMINED: 252 males, 263 females. CANADA: *British Columbia*: Salmon Arm, banks of Shuswap River, October. Summerland, May, November. Vernon, August. Victoria. UNITED STATES: *California*: ALAMEDA CO.: May. CALAVERAS CO.: Mokel Hill, July. COLUSA CO.: Bartlett Springs road, Bear Valley, Bear Creek, April. 1.5 mi. SW. of Lodoga on road to Cooks Springs, Indian Creek, April. 4 mi. SW. Lodoga, Indian Creek, Cooks Springs, 1480′, July. South Fork Stony Creek, 1800′, May. FRESNO CO.: 5 mi. NE. Academy, route 168, 670′, September (muddy edge of drying stock pond). Kings River, Route 180, August. Kings River Camp, August. GLENN CO.: Logan Basin, Estella Creek, 16.25 mi. W. of Elk Creek, 3450′, August. 0.5 mi. W. of Newville, North Fork Stony Creek, April. 7 mi. N. of Stonyford, tributary to Stony Creek, March. HUMBOLDT CO.: Alderpoint-Blocksburg road, South Dobbyn Creek, 450′, July. Alderpoint-Bridgeville road, Larabee Creek, 1100′, July. First crossing E. of Bridgeville, South Fork Van Duzen River, July. 3 mi. S. Bridgeville, Burr Creek, 1200′, July. 10 mi. S. Bridgeville, Martin Creek, 1150′, July. 1.3 mi. W. of Dinsmore, Van Duzen River, July. Garberville-Alderpoint road, Frenchman Creek, July. Green Point Ranch, 1500′, June. Willow Creek at Willow Creek, July. Willow Creek just above its East Fork, 1500′, August. KERN CO.: Havilah, April. LAKE CO.: Bartlett Springs, Bartlett Creek, August. 1.7 mi. W. Kelseyville, Kelsey Creek at Gross Ford, October. 2.75 mi. S. of Lower Blue Lake, Scott Creek, August. 0.5 mi. N. Upper Lake, Middle Creek, August. LASSEN CO.: Eagle Lake, July. Madeline, July. LOS ANGELES CO.: Littlerock, Mojave Desert. San Gabriel River, W. Fork Station, 3100′, July, August. MADERA CO.: Bates Station, March. Clover Meadow-North Fork road, West Fork Chiquito Creek, 4450′, August. 4.75 mi. ESE. Fish Camp, Big Creek at Boggy Meadow, 6400′, August. North Fork, May. MARIN CO.: Fairfax, April, August. Lagunitas, June. Novato, October (black light). Tocaloma, Lagunitas Creek, May. MENDOCINO CO.: Beebe Creek, September. Black Butte River just above mouth, July. 1 mi. E. of Cold Creek, East Fork Russian River, October. Covelo-Paskenta road, Williams Creek, July, August, October. Dry Creek, highway 128, September. Middle Fork Eel River, 0.3 mi. below mouth of Black Butte River, 1500′, July. Longvale-Covelo road, 7 mi. E. route 101, Bloody Run Creek, 1100′, July. Longvale-Dos Rios road, Outlet Creek, August. W. of Mailliard Redwoods State Park, Mill Creek, September. Twin Rocks, July. 2 mi. S. of Yorkville, Rancheria Creek, July. MERCED CO.: Merced, May. MODOC CO.: 9.5 mi. S. of Cedarville, Cottonwood Creek, 4950′, August. MONO CO.: Stone Creek, April. MONTEREY CO.: Lewis Creek, August. Marina, September. NAPA CO.: 4 mi. N. of Lake Berryessa, Eticuera Creek, August. Pope Creek at Walter Springs Road, 520′, July. NEVADA CO.: Truckee, 5800′, August. ORANGE CO. PLUMAS CO.: Clio, Middle Fork Feather River, August. RIVERSIDE CO.: Idlewild, July. San Jacinto Mountains. SAN BENITO CO.: San Benito River, June. SAN BERNARDINO CO.: Hesperia, June. Miller Canyon Public Campground, July. SAN DIEGO CO.: Cleveland National Forest, Pine Valley Creek, 4800′, July. Descanso, June, September. El Monte Oaks, June. Mission Dam, September. Pamo Valley, April. San Mateo Canyon, October (under willows near stream bed). San Vincente Valley, April, June. SAN MATEO CO. SANTA BARBARA CO.: Santa Barbara. Santa Inez Mountains. SANTA CLARA CO.: Gilroy. Mt. Hamilton, August. SHASTA CO.: Redding, June. SISKIYOU CO.: 2.3 mi. NW. of Callahan, Sugar Creek, August. 1.5 mi. NE. of Cecilville, South Fork Salmon River, July. Cole, July. 3 mi. S. Fort Jones, June. 1.3 mi. E. of Grenada, Shasta River, August. 10 mi. W. of Montague, July (along creek). 5 mi. S. of Mt. Hebron, Butte Creek, September. 0.7 mi. W. of Seiad, Klamath River, August. Somes Bar-Callahan road, Nordheimer Creek 3.7 mi. NW. of Forks of Salmon, July. SONOMA CO.: Creek by highway 128 NW. of Cloverdale, October. Camp Meeker. Skaggs Springs, Warner Springs Creek, September. STANISLAUS CO.: Del Puerto Creek 4 mi. W. of route 5, September. 22 mi. W. of Patterson, Adobe Creek, April. SUTTER CO.: Lomo, May. TRINITY CO.: 3.3 mi. SW. of Denny, Panther Creek, 1300′, August. 7 mi. E. of Hayfork, Summit Creek, route 3, 2700′, August. Hayfork-Wildwood road, Hayfork Creek, August. Hyampom, Kerlin Creek, Big Slide road, July. 0.5 mi. E. of Hyampom, Hayfork Creek, July. 4.25 mi. SE. of Ruth, Mad River just above mouth of Van Horn Creek, Mad River, August. TULARE CO.: Gray Meadow, July. 9.5 mi. N. of Kernville, Kern River, March. Lower Kaweah River, August. TUOLUMNE CO.: Sonora. VENTURA CO.: Fillmore, March. Tejon Pass, July. *Montana*: BLAINE CO.: Bear Paw Mountains. *Nevada*: ELKO CO.: Elko. STOREY CO.: Virginia City, Six Mile Canyon, June. *Oregon*: DOUGLAS CO.: Roseburg, May (black light). 2 mi. E. Tiller, Tilson Creek, May. HARNEY CO.: N. of Burns, Poison Creek, June. JACKSON CO.: 3 mi. W. Dead Indian Soda Spring, May (under rocks on stream bank). Medford, July. JOSEPHINE CO.: Selma, May. KLAMATH CO.: 3 mi. SE. of Bly, Pole Creek, April. 7 mi. NW. of Bly, Meryl Creek, June. 10 mi. NE. of Bly, Deming Creek, June. 15 mi. NW. of Bly, (edge of creek). LAKE CO.: Crooked Creek, June. MALHEUR CO.: Sucker Creek at highway 95, July. WASCO CO.: The Dalles. WASHINGTON CO.: Banks, August. *Washington*: GRAYS HARBOR CO.: Humptulips, August. JEFFERSON CO.: Olympic National Park, Queets Ranger Station, May. KING CO.: South Fork Skykomish River, July. LINCOLN CO.: Sprague Lake, July. SNOHOMISH CO.: Cicero, North Fork Stilaguamish River, August. SPOKANE CO.: Spokane. *Wyoming*: FREMONT CO.: 10 mi. NW. of Burris, East Fork Wind River, August. YELLOWSTONE NATIONAL PARK: July. Near White Dome Geyser, August.

THE ATRA GROUP

Diagnosis: Dorsal surface yellow to blackish brown, pronotum and elytra sometimes with pale border, head black; protibiae of males elbowed on inner margin (fig. 19, etc.) and with series of flat, slanting plates on medial surface of apical portion (fig. 20, etc.); male metasternum without larger bristles; parameres, taken together, slightly to much longer than broad (fig. 17, etc.).

This group of seventeen species occurs throughout the New World. Within the group there appear to be two nuclei of closely related species. Five species, *atra*, *atroides*, *hespera*, *spinata*, and *leechi*, are dark colored dorsally and are from North America, and most of them have the parameres roughly parallel sided. *C. pusilla* is similar but smaller and with the parameres much reduced. Eight species, *pamphila*, *hermani*, *argentina*, *pamphiloides*, *panda*, *malkini*, *goldbachi*, and *bruchi* are dorsally light yellow to dark brown, except for the black head, and are from South America. Most of these latter species also have a semimembranous area on the dorsum of each paramere. *C. pallida* is similar but is from North America. Relationships of those species not mentioned above are uncertain. See further discussion in the phylogeny section.

Chaetarthria atra (LeConte)

(Figures 17, 18, 19, 20, 24)

Cyllidium atrum LeConte, 1863, p. 24. Type locality: New York. Type male in Museum of Comparative Zoology (Harvard University), and examined by me for this study.

Chaetarthria atra: Horn, 1873, p. 125. Fall, 1901, pp. 12, 216. Richmond, 1920, p. 51. Wooldridge, 1967, p. 430. Malcolm, 1971, p. 36.

Chaetarthria nigrella: Wickham, 1895, p. 185 (not LeConte) (misidentification). Wickham cites this species from Ontario and/or Quebec, where *atra* is the only dark species known; *nigrella* is from western North America.

Diagnosis: This is the only dorsally dark colored species of the genus found in the eastern half of the United States and adjacent Canada. *C. hespera* and *atroides* approach the western limits of *atra* but do not appear to be sympatric with it, and they differ from it in both the male protibiae and the aedeagus. Also *atroides* has sharply defined pale elytral and pronotal margins and is somewhat attenuate posteriorly, characters which *atra* lacks. The elytral length is generally 1.6 to 1.8 mm. for *atra*.

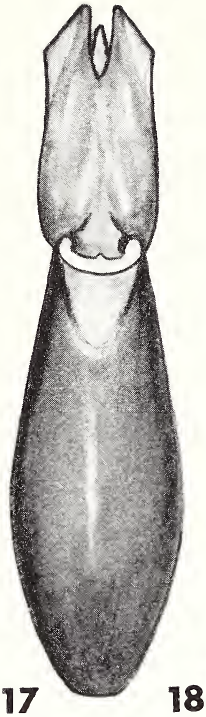
Distribution: Southern Quebec and Nova Scotia south to Maryland and West Virginia and west to Missouri and Iowa; females collected without males in Kansas, Michigan and Nebraska probably belong to this species also.

MALE [based on holotype, locality label a pink disc (MCZ)]: Shape oval, fairly convex. Head black, punctation sparse and shallow, no micropunctation between major punctures, vestiture very light. Pronotum, scutellum and elytra reddish brown, pronotum laterally and elytra apically slightly paler, pronotum nearly impunctate and glabrous, no micropunctation between major punctures. Elytral punctures larger, in discal area in alternate irregular and somewhat regular rows, those of irregular rows bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable nearly two thirds of way from apex to base. Ventral surface very dark reddish brown except prosternum, legs and abdomen pale reddish brown and palpi and antennae yellowish. Protibiae in anterior view widening sharply from base for about one-fourth of length, then very gradually narrowing toward apex, about four times as long as greatest width, inner face of apical portion with series of flat, slanting plates close together, most extending slightly beyond posterior margin of tibiae, eleven plates on each protibia. Aedeagus in dorsal view with the parameres elongate, nearly parallel sided, together drawn out to point at middle of tip, paramere sides weakly sclerotized in about apical third; apical portion of penis slender, barely visible between paramere tips; basal piece long, narrowing towards juncture with parameres; in lateral view basal piece slightly concave ventrally, about twice as long as parameres; ventral sclerotized portion of paramere sharply bowed near middle, dorsal portion slightly concave.

FEMALE [based on specimen from Ripley Co., Missouri, Buffalo Creek at Route C, 5.5 mi. N. of Briar, August 5, 1967, Hugh B. Leech (CA)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Pronotal and elytral coloration vary from light brown to nearly black, and generally are somewhat reddish. The elytral and pronotal borders may be from much paler to not at all paler than the discs, with the contrast usually greater in darker specimens. Two females from Washtenaw County, Michigan (UW) are somewhat shorter but more robust than usual, and since they were taken without accompanying males they could possibly represent another species.

SPECIMENS EXAMINED: 40 males, 42 females. CANADA: *Nova Scotia*: COLCHESTER CO.: Portaupique, July. *Quebec*: BROME CO.: Brome, June. Potton Springs (♀ only). UNITED STATES: *Arkansas*: BOONE CO.: Alpena, June (at light) (♀ only). RANDOLPH CO.: 4 mi. N. of Pocahontas, August (stream). *Illinois*: CHAMPAIGN CO.: Mahomet, Nettie Hart Woodland, July (black light) (♀ only). JACK-



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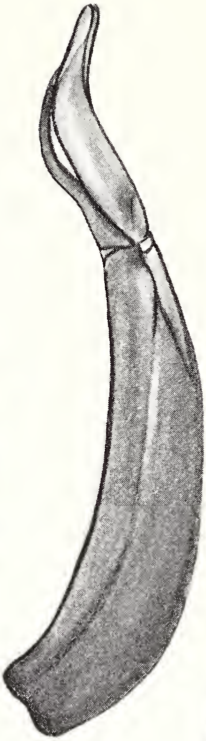

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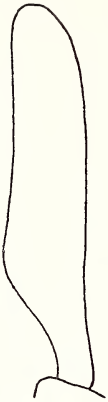

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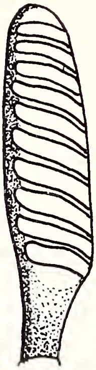

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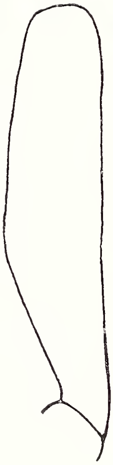

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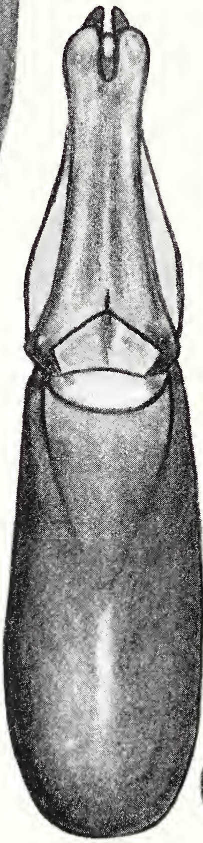

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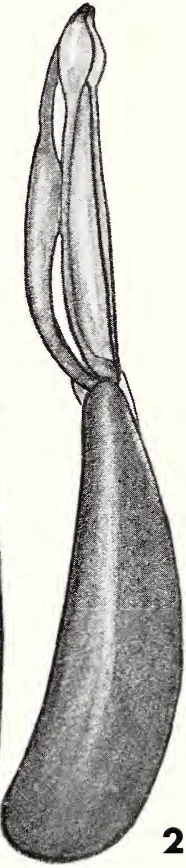

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SON CO.: Giant City State Park, July. *Iowa*: BUCHANAN CO.: Backbone State Park, near Strawberry Point, August. *Kansas*: Republican River (♀ only). *Maine*: OXFORD CO.: Paris, Stony Brook, June. *Maryland*: MONTGOMERY CO.: Plummers Island, April. *Michigan*: WASHTENAW CO.: August (♀ only). *Missouri*: BARRY CO.: Roaring River State Park, June. BOONE CO.: 5 mi. S. Columbia, April. BUTLER CO.: 12 mi. SE. of Ellsinore, stream at Highway 60, August. CRAWFORD CO.: Meramec River, State Highway 8, July. 8 mi. W. Steelville, Meramec River, October (♀ only). DALLAS CO.: Bennet Springs, August. HOWELL CO.: Willow Springs, June. MCDONALD CO.: 3 mi. N. Noel, Elk River, Highway 59, August. REYNOLDS CO.: Ellington, Logan Creek, August (♀ only). RIPLEY CO.: 5.5 mi. N. of Briar, stream at Route C, August. 5.5 mi. N. of Briar, Buffalo Creek at Route C, July. *Nebraska*: THOMAS CO.: 2.5 mi. W. of Halsey, Nebraska National Forest, July (♀ only). *New Hampshire*: STRAFFORD CO.: Farmington, August (♀ only). *New York*: CHAUTAQUA CO.: Chautauqua ? ("Chaut."). TOMPKINS CO.: Ithaca, May. ULSTER CO.: Phoenicia, July. *Tennessee*: DAVIDSON CO.: Nashville, August. *West Virginia*: GREENBRIAR CO.: White Sulphur (Springs ?). Females taken without males are only tentatively identified.

Chaetarthria atroides, new species
(Figures 21, 22, 23, 24)

DIAGNOSIS: This species is generally recognizable by the sharply defined pale sides and elytral apex, as other species sympatric with it are usually only vaguely paler in those areas (see map). However some specimens of other dorsally dark species may approach *atroides* in the sharpness of the pale border, particularly darker specimens. The elytral length of *atroides* is generally 1.7 to 2.0 mm., while *atra*, which appears to be nearly but not quite sympatric with it, and *hespera*, which is sympatric, are generally under 1.8 mm. *C. magna*, which is also apparently not quite sympatric with *atroides*, is generally over 1.8 mm. Males of *atroides* may be recognized by the slight attenuation of the posterior of the body, by the protibiae with seven or eight plates on the medial face of the apical portion, and by the aedeagus.

←

FIGS. 17–23. Fig. 17. *Chaetarthria atra*, aedeagus, dorsal. Fig. 18. same, lateral. Fig. 19. same, left protibia, anterior face. Fig. 20. same, medial face. Fig. 21. *C. atroides*, left protibia, anterior face. Fig. 22. same, aedeagus, dorsal. Fig. 23. same, lateral.

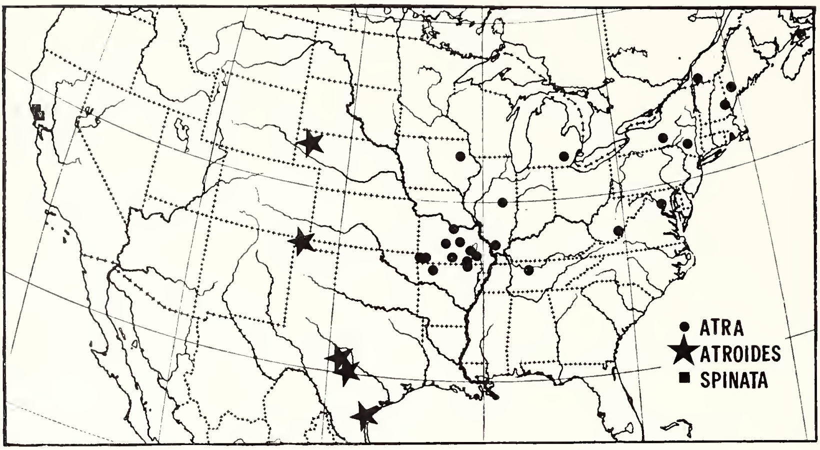


FIG. 24. Distribution of *Chaetarthria atra*, *C. atroides* and *C. spinata*.

DISTRIBUTION: Central Texas to Nebraska.

HOLOTYPE: Male, 16 mi. S. of Brady, on San Saba River, McCulloch Co., Texas, June 13, 1963, D. C. and K. A. Rentz (CA). Shape oval, fairly convex, elytra somewhat attenuate posteriorly. Head black, punctation sparse and shallow except labrum with many fine punctures, no micropunctation between major punctures, with only a few scattered, very fine hairs. Pronotum, scutellum and elytra dark reddish brown, sharply paler at sides of pronotum and elytra and in about apical quarter of elytra, pronotum nearly devoid of punctation and vestiture, lacking micropunctation, elytral punctation moderately coarse and thick, in alternate irregular and somewhat regular rows, punctures of irregular rows bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable for about two thirds of distance from apex to base. Ventral surface black except legs and prosternum reddish brown, palpi and antennae yellowish brown. Protibiae in anterior view widening fairly sharply from base for slightly less than half of length, then gradually narrowing to apex, about four times as long as greatest width, inner face of apical portion with a series of flat, slanting plates fairly close together, most extending slightly beyond posterior margin of tibia, seven on right protibia, eight on left. Aedeagus in dorsal view with parameres parallel sided in about basal two fifths, then gradually narrowing to apex except somewhat bulbous at tip, side portions at tip weakly sclerotized, each paramere with tooth on inner margin of tip; tip of penis barely visible, not extending to tip of parameres; basal piece long, widest near anterior end; in lateral view basal piece slightly longer than parameres; dorsal sclerotized portion of paramere nearly straight except humped at tip, ventral sclerotized portion gently curved near base and broader just beyond middle of its length. EL 1.84 mm., GW 1.45 mm., GH .96 mm., GW/EL .79, GH/EL .52, PL .40 mm.

ALLOTYPE: Female, same data as holotype (CA). Externally like holotype except much less attenuate posteriorly and lacking secondary sexual modifications of protibiae. EL 1.93 mm., GW 1.54 mm., GH .96 mm., GW/EL .80, GH/EL .50.

VARIATION: No appreciable variation noted except that females differ consistently from males in being much less attenuate posteriorly.

PARATYPES (7 ♂♂, 8 ♀♀): UNITED STATES: *Nebraska*: SHERIDAN CO.: 14 mi. S. Hay Springs, Niobrara River, 1 ♂, 1 ♀, September 5, 1970, Lee Herman (AMNH). *Oklahoma*: CIMARRON CO.: 25 mi. NW. of Boise City, Black Mesa, at south end Lake Carl Etling, 1 ♂, 1 ♀, August 14, 1967, Hugh B. Leech (CA). *Texas*: GILLESPIE CO.: Lange's Mill, 4 ♂♂, 5 ♀♀, June 5, 1969, Board and Hafernik (DM, TAM). SAN PATRICIO CO.: Welder Wildlife Refuge, 1 ♂, 1 ♀, June 28, 1969, Board and Hafernik (TAM).

Chaetarthria hespera, new species
(Figures 25, 26, 27, 28, 33)

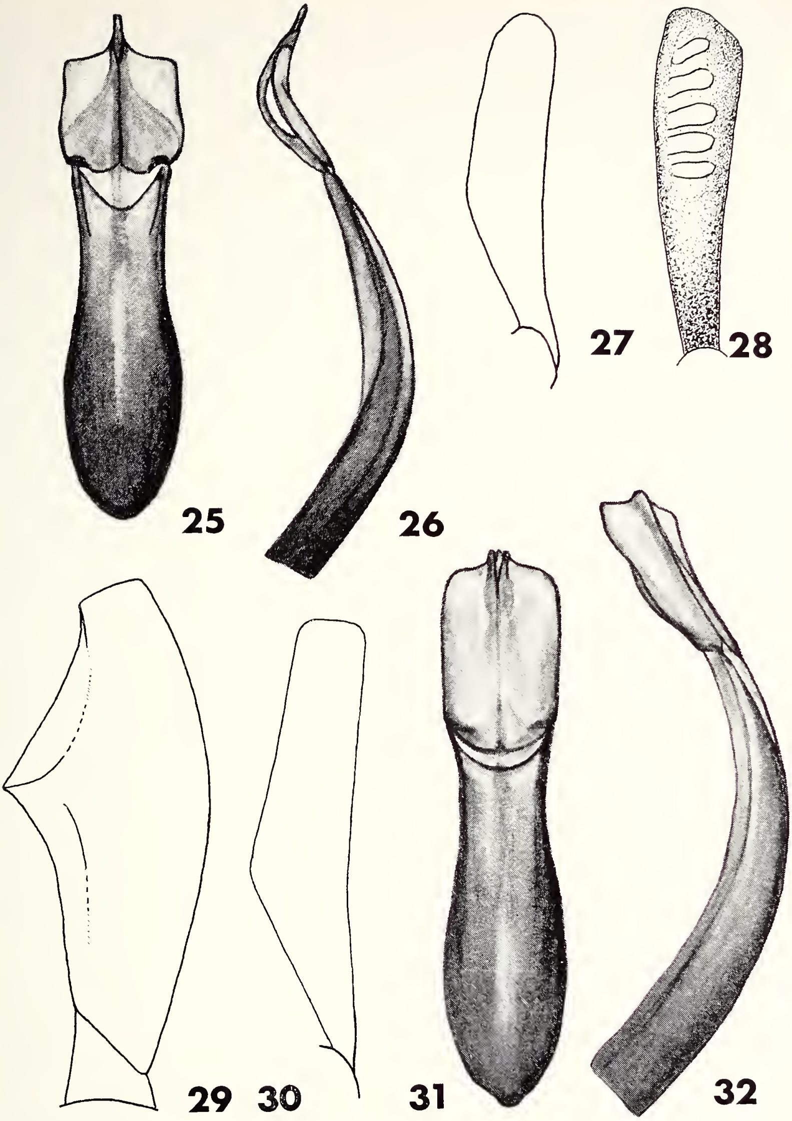
DIAGNOSIS: This species is largely sympatric with *C. nigrella* from which it differs in larger average size (elytral length of *nigrella* generally 1.4 to 1.6 mm., of *hespera* generally 1.5 to 1.7 mm.) and in having the pronotum without micropunctation between the larger punctures. Also *hespera* tends to be more reddish and *nigrella* more blackish dorsally, and although *hespera* occasionally has the sides and apex of the elytra with a fairly sharply defined pale border it is never as sharply defined as in southern California populations of *nigrella*. See also *C. spinata*, *magna* and *punctulata*, which are dorsally dark and at least partially sympatric or nearly sympatric with *hespera*.

DISTRIBUTION: Southwestern United States north to San Francisco Bay area and east to central Oklahoma. The species undoubtedly also extends into Mexico, but no specimens are known from there.

HOLOTYPE: Male, South West Research Station, 5 mi. W. of Portal, Cochise Co., Arizona, 5400′, July 25, 1956, E. Ordway (AMNH). Shape oval, fairly convex. Head black, shallowly but fairly thickly punctate, no micropunctation between major punctures, nearly glabrous, labrum with many fine punctures. Pronotum, scutellum and elytra reddish brown, pronotum narrowly yellowish at sides and inward along front and back margins, apical portion of elytra slightly paler than disc, pronotum finely and sparsely punctate, no micropunctation between major punctures, nearly glabrous, elytral punctures larger, in alternate irregular and vaguely regular series, those of irregular series bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except legs, palpi, antennae, prosternum and part of sides of third and fourth abdominal sternites yellowish brown. Protibiae in anterior view widening sharply from base for about half of length, then very gradually narrowing toward apex, about four times as long as greatest width, inner face of apical portion with series of flat, slanting plates close together, five on each protibia. Aedeagus in dorsal view with parameres broad and flat, together forming nearly a square, each paramere with inner apical corner attenuate; penis tip not visible (although visible between paramere apices in some other specimens, and slender); basal piece long, parallel sided, narrower just before junction with parameres; in lateral view basal piece curved, concave ventrally, if straightened out would be nearly three times length of parameres; ventral sclerotized portion of parameres bent nearly at right angle near middle so apical half points nearly dorsally. EL 1.66 mm., GW 1.37 mm., GH .84 mm., GW/EL .82, GH/EL .51, PL .16 mm.

FEMALE [based on specimen with same data as holotype (AMNH); no allotype designated]: Externally like holotype except lacking secondary sexual modifications of protibiae.

VARIATION: Specimens from the extreme eastern parts of the range tend to have darker dorsal color, sometimes with indications of a pale elytral border. They also average greater in paramere length and often have more than five plates on the male protibiae (five being the number for nearly all California specimens), up to seven in some males from Texas. Since these localities are east of the range of *C. nigrella* it at first seemed that this might be a case of character displacement, with *hespera* being less blackish than *nigrella* where they are sympatric; however 33 *hespera* from 7 miles south of Walnut Creek, Contra Costa County, California are nearly all quite blackish and this is well within the geographical range of *nigrella*. All of the localities where *hespera* is known to be rather blackish are, however, on the periphery of the range of that species, and it has been observed a number of times that peripheral populations of organisms tend to be more variable and to have more extreme characters than central populations. In addition to the Walnut Creek locality noted above the other most northerly localities, Sunol (Alameda County, Cali-



FIGS. 25–32. Fig. 25. *Chaetarthria hespera*, aedeagus, dorsal. Fig. 26. same, lateral. Fig. 27. same, left protibia, anterior face. Fig. 28. same, medial face. Fig. 29. *C. spinata*, left mesofemur, anterior face. Fig. 30. same, left protibia, anterior face. Fig. 31. same, aedeagus, dorsal. Fig. 32. same, lateral.

fornia) and Lagunitas (Marin County, California) are represented by single males which are slightly darker than average for the species.

PARATYPES AND FEMALES (total 275 ♂♂, paratypes, 331 ♀♀, not paratypes): UNITED STATES: *Arizona*: No further data, 2 ♂♂, 1 ♀ (AMNH, PAS). COCHISE CO.: Ash Canyon, 1 ♂, 1 ♀, July 25, 1968, D. E. Bright (CNC). Bear Canyon, Huachuca Mountains, 1 ♂, May 8, 1953, A. and H. Dietrich (CU). Charleston Crossing, San Pedro River, 1 ♂, 1 ♀, April 15, 1969, D. and J. Schuh (JS). Guadelupe Canyon, 4200′, 2 ♂♂, 2 ♀♀, June 11, 1968, Vincent D. Roth (SWRS). Guadelupe Canyon, Guadelupe Mountains, 44 ♂♂, 50 ♀♀, June 10–11, 1968, Menke and Flint (DM, USNM). 10 mi. E. McNeal, Swisshelm Mountains, 3 ♂♂, 2 ♀♀, April 15, 1969, D. and J. Schuh (JS). 5 mi. W. Portal, South West Research Station, 5400′, 10 ♂♂, 14 ♀♀, same data as holotype (AMNH, DM), 1 ♂, 3 ♀♀, July 15, 1967 (SWRS), 1 ♂, August 4, 1957, C. P. Alexander (JS). Sierra Vista, Huachuca Mountains, 1 ♂, May, 1965, R. F. Sternitzky (CNC). Texas Pass, Dragoon Mountains, 1 ♂, 1 ♀, July 21, 1917, C. U. Biol. Exped (CU). COCONINO CO.: Flagstaff, 2 ♂♂, 1 ♀, Dr. A. Fenyes (CA). Grand Canyon, Bright Angel Trail, 1 ♂, July 31, 1914, J. C. Bradley (CU). GILA CO.: Globe, 1 ♂, 1 ♀, July 6, 1935, Parker (CA). Globe, Pinal Creek, 1 ♂, 4000′, June 6, 1953, A. and H. Dietrich (CU). GREENLEE CO.: 21 mi. N. Clifton, 2 ♂♂, July 12, 1968, D. E. Bright (CNC). MARICOPA CO.: Cave Creek Canyon, Chiricahua Mountains, July (♀ only). PIMA CO.: Tucson, 2 ♂♂, 1 ♀ (USNM). 10 mi. NE. Tucson, Santa Catalina Mountains, 3000′, May (♀ only). PINAL CO.: Riverside, 3 ♂♂, 1 ♀ (CA, USNM). Superior, 1 ♂, 1 ♀, July 30, 1948, H. K. Gloyd (light) (INHS). Superior, Boyce Thompson Arboretum, 2 ♂♂, 2 ♀♀, July 12 and 15, 1949, B. W. Benson (light trap) (INHS). SANTA CRUZ CO.: No further locality, 1 ♂, August, K. Koebele (USNM). 2.5 mi. W. of Harshaw, Patagonia Mountains, 1 ♂, July 2, 1952, H. B. Leech and J. W. Green (CA). Madera Canyon, Santa Rita Mountains, 1 ♂, July 29, 1968, D. E. Bright (CNC). Nogales, 7 ♂♂, 5 ♀♀, August 16, 1940, F. W. Nunenmacher (CA, CNHM). Nogales, Mt. Washington, 6000′, July (♀ only). Patagonia, 3 ♂♂, 13 ♀♀, July 10, 1936, E. S. Ross (CA). Santa Rita Mountains, 1 ♂, 2 ♀♀, July 11, 1950, L. D. Beamer (KU). Yank's Spring, Sycamore Canyon, Tumacacori Mountains, 1 ♂, 3 ♀♀, August 3, 1952, Hugh B. Leech (CA). YAVAPAI CO.: Bumblebee, 1 ♂, 1 ♀, May 20, 1919, E. Schiffel, J. W. Green (CA). Prescott, 1 ♂, June 30, 1918 (CA). YUMA CO.: No further locality, 1 ♂, June (RBM). *California*: No further locality, 1 ♂ (CA), 1 ♂, June, 1897 (LAM), 1 ♂, 1 ♀, Horn (PAS).

ALAMEDA CO.: Berkeley, September (♀ only). Sunol, 1 ♂, September 14, 1919 (CA). CONTRA COSTA CO.: 7 mi. S. Walnut Creek, margins of Bollinger Creek, 19 ♂♂, 14 ♀♀, March 24, May 10 and May 17, 1968, L. Neil Bell (AMNH, CA, DM, LNB). KERN CO.: 3.5 mi. E. Caliente, Harper Canyon Creek, 1 ♂, March 26, 1970, Hugh B. Leech (CA). 4 mi. E. of Caliente, Caliente Creek, 8 ♂♂, 9 ♀♀, March 26, 1970, Hugh B. Leech (CA, DM). 0.5 mi. N. of Havilah, Havilah Creek, 4 ♂♂, 10 ♀♀, March 25, 1970, Hugh B. Leech (CA). Lebec, 2 ♂♂, 2 ♀♀, May 12, 1916, J. O. Martin (CA). Tejon Pass, 1 ♂, July 28, 1918 (CA). Wofford Heights, 2300′, June (at light) (♀ only). LOS ANGELES CO.: No further data, 1 ♂ (USNM). Los Angeles (♀ only). Littlerock, Mojave Desert, 3 ♂♂, 2 ♀♀ (CA). Mt. Wilson (♀ only). Pasadena, 6 ♂♂, 5 ♀♀, J. O. Martin (CA), 1 ♂, 1 ♀, February (CA), 1 ♂, February, Dr. A. Fenyes (CU), 3 ♂♂, Dr. A. Fenyes (CNHM, MCZ), 1 ♂, October 10, 1897 (MCZ). Rincon, San Gabriel River, Station 1800′, 22 ♂♂, 18 ♀♀, September 26, 1970, P. D. Perkins (PP). San Fernando, 1 ♂, 2 ♀♀, April 1, 1920, F. Winters (CA). San Gabriel River, West Fork, Station 3100′, 17 ♂♂, 18 ♀♀, July 10 and August 1, 1970, P. D. Perkins (PP). Tujunga Canyon, May (♀ only). MARIN CO.: Lagunitas, 1 ♂, May 11, 1942, H. P. Chandler (CA). MONTEREY CO.: Carmel, July (♀ only). Lewis Creek, 1 ♂, August 29, 1952, Hugh B. Leech (CA). ORANGE CO.: No further data (♀ only). Santa Catalina, 1 ♂, 1 ♀, H. C. Fall (MCZ). RIVERSIDE CO.: Dripping Springs Camp, Arroyo Seco Creek, Cleveland National Forest, 1 ♂, 1 ♀, July 8, 1969, B. S. Cheary (DM). Garner Valley E. of Lake Hemet, 12 ♂♂, 10 ♀♀, April 16, 1971, I. M. Newell (BC, DM). Idyllwild ("Idlewild"), 6 ♂♂, 8 ♀♀, July 8, 1928 (CA, DM). 4 mi. S. Palm Desert, P. L. Boyd Desert Research Center, Deep Canyon, 1 ♂, July 24, 1969, S. Frommer (DM). Riverside, 1 ♂, 1 ♀ (CA). San Jacinto Mountains, 6 ♂♂, 9 ♀♀ (CA). SAN BERNARDINO CO.: Arrowhead, May (♀ only). Miller Canyon Public Campground, 2 ♂♂, 1 ♀, July 9, 1964, G. R. Noonan (UCR). SAN DIEGO CO.: Campo, 1 ♂, May 27, 1928 (CA). San Mateo Canyon, 4 ♂♂, 9 ♀♀, October 22, 1967, K. Cooper (Berlese, under willow) (BC, DM). San Vincente Valley, June (♀ only). SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, March (by splashing water on sand) (♀ only). Santa Margarita, 1 ♂, June 25, 1916, J. O. Martin (CA). SAN MATEO CO.: La Honda (♀ only). SANTA CLARA CO.: 4 ♂♂, 1 ♀, Baker (AMNH, CM). SONOMA CO.: Geysers, 1 ♂, May 21, 1879 (INHS). VENTURA CO.: Filmore, 1 ♂, 1 ♀, March 21, 1923 (KU). *Colorado*: JEFFERSON

CO.: Deer Creek Canyon, July (♀ only). MOFFAT CO.: 2 mi. E. Maybell, Deception Creek, 5910′, 1 ♂, 1 ♀, July 13, 1967, H. B. Leech (CA). *New Mexico*: GRANT CO.: Silver City, 1 ♂, 1 ♀, July, 1913, J. B. Wallis (CNC), 1 ♂, July 22, 1936, J. D. Beamer (KU). LINCOLN CO.: 5 mi. N. Angus, Highway 37, 7050′, 1 ♂, August 7, 1965, Hugh B. Leech (CA). SANTA FE CO.: Santa Fe, 1 ♂, 3 ♀♀ (CNC), 1 ♂, 2 ♀♀, August, 1897 (CA). SIERRA CO.: 4 mi. E. of Hillsboro, Piedra River Gorge in Mimbres Mountains, 1 ♂, 1 ♀, August 31, 1952 (CNHM). *Oklahoma*: CADDO CO.: Hinton, June (♀ only). CIMARRON CO.: 25 mi. NW. of Boise City, at S. end Lake Carl Etling, Black Mesa State Park, 3 ♂♂, 12 ♀♀, August 14, 1967, Hugh B. Leech (CA, DM). 7 mi. E. of Kenton, N. Crease Creek, 2 ♂♂, 1 ♀, August 14, 1967, Hugh B. Leech (CA). *Texas*: BREWSTER CO.: 20 mi. S. of Alpine, 6 ♂♂, 5 ♀♀, May 12, 1927, J. O. Martin (CA). Panther Junction, Big Bend National Park, 4000′, 1 ♂, May 8, 1959, Howden and Becker (at light) (CNC). CULBERTSON CO.: 2½ mi. E. of Nickel Creek Station, 1 ♂, September 2, 1952, Borys Malkin (CNHM). JEFF DAVIS CO.: Fort Davis, 4 ♂♂, 4 ♀♀, May 30, 1959, Howden and Becker (at light) (CNC). Limpia Creek Canyon, Davis Mountains, 2 ♂♂, 2 ♀♀, September 4–5, 1952, Borys Malkin (CNHM). LLANO CO.: Enchanted Rock, April (♀ only). PRESIDIO CO.: Presidio, April (♀ only). *Utah*: WASHINGTON CO.: Chad's Ranch, 1 ♂, 1 ♀, July 22, Wickham (CA). County ?: Escalante River, mouth of Calf Creek (♀ only). *Wyoming*: LARAMIE CO.: 12.5 mi. NE. of Cheyenne, Lodgepole Creek at Highway 85, 1 ♂, 4 ♀♀, August 18, 1965, Hugh B. Leech (CA). PLATT CO.: 2 mi. S. of Glendo, Horseshoe Creek, 1 ♂, 3 ♀♀, July 29, 1964, Hugh B. Leech (CA). 5.8 mi. S. of Glendo, stream under Highway 87, July (♀ only). Females taken without males are only tentatively identified.

Chaetarthria spinata, new species
(Figures 24, 29, 30, 31, 32)

DIAGNOSIS: Males can be easily determined by the presence of a broad tooth on the hind margin of the mesofemora, as well as by the protibiae with ten to twelve plates and the aedeagus. Females might be confused with those of *C. nigrella* or *C. hespera*. However *spinata* is larger than *nigrella* (elytral length for *spinata* generally 1.7–2.1 mm., for *nigrella* 1.4–1.6 mm.), and averages much more lightly micropunctate between the major punctures on the pronotum, and appears to be slightly north of the range of *hespera*, which lacks any micropunctation. See also *C. punctulata*, which is also western but apparently has a range which ends considerably south of that of *spinata*, and *C. leechi*, which is rather rare.

DISTRIBUTION: Sonoma and possibly Mendocino counties, California, near the Pacific Coast.

HOLOTYPE: Male, South Fork Gualala River, at bridge, N. road to Annapolis, Sonoma County, California, October 12, 1964, Hugh B. Leech (CA). Shape oval, fairly convex. Head black, punctation thick but fairly shallow, very lightly micropunctate between major punctures, labrum with many finer punctures. Pronotum, scutellum and elytra dark brown, pronotum and scutellum blackish, pronotum yellow laterally, elytra more reddish, lacking distinct pale areas, pronotum thickly but shallowly punctate, very lightly micropunctate between the major punctures, vestiture very sparse, elytra with larger punctures, in alternate irregular and vaguely regular series, those of the irregular series bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of the way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs, and areas at sides of third and fourth abdominal segments brown. Protibiae in anterior view widening sharply from base for about two fifths of length, then narrowing to apex, about four times as long as greatest width, inner face of apical portion with a series of flat, slanting plates very close together, ten on each protibia. Mesofemora with posterior margin extended to form a broad, definite tooth about one third of way from apex. Aedeagus in dorsal view with parameres flat and broad, together forming a rectangle nearly twice as long as broad, each paramere with inner corner attenuate; penis tip just visible between apices of parameres; basal piece long, nearly parallel sided, narrowed just before juncture with parameres; in lateral view basal piece curved, if straightened out would be about three times length of parameres; ventral sclerotized portion of parameres bowed ventrally at middle, forming scoop-like shape, dorsal sclerotized portion more or less flat. EL 1.73 mm., GW 1.51 mm., GH .88 mm., GW/EL .87, GH/EL .49, PL .23 mm.

ALLOTYPE: Female with same data as holotype (CA). Externally like male except lacking secondary sexual modifications of protibiae and mesofemora. EL 1.89 mm., GW 1.54 mm., GH .90 mm., GW/EL .81, GH/EL .48.

VARIATION: The micropunctation of the pronotum is extremely light and difficult to see in some specimens, somewhat more definite in others. The pale margin of the pronotum is usually rather

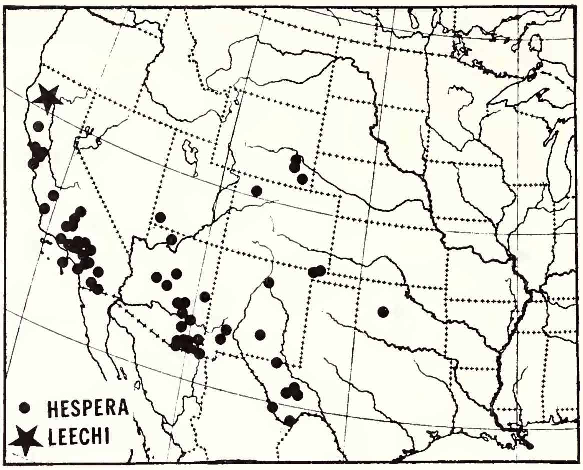


Fig. 33. Distribution of *Chaetarthria hespera* and *C. leechi.*

sharply defined, but the apex of the elytra is seldom any more than slightly paler than the disc.

Paratypes and Females (total 14 ♂♂, paratypes, 47 ♀♀, not paratypes): United States: *California*: mendocino co.: Garcia River at Highway 1, October (♀ only). 7 mi. E. of Route 101 on Longvale-Covelo Road, Bloody Run Creek, 1100′, July (♀ only). sonoma co.: 13 ♂♂, 34 ♀♀, locality as holotype, September 6, September 7 and October 12, 1964, Hugh B. Leech (CA, DM, USNM). 3 mi. S. of Cazadero, Austin Creek, 1 ♂, 10 ♀♀, April 15, 1950, Hugh B. Leech (CA). Guerneville, July (♀ only).

Chaetarthria leechi, new species
(Figures 33, 34)

Diagnosis: The only other dark colored species known to be sympatric with *leechi* is *C. nigrella*, which is smaller (elytral length generally 1.4 to 1.6 mm. compared to 1.8 to 2.1 mm. for *leechi*) and usually has more evident micropunctation on the pronotum (the micropunctation of *leechi* males is extremely faint and absent on the only known female). *C. hespera* and *spinata* are close enough to be possibly sympatric, but the former is more reddish on the pronotum and elytra than *leechi* and the latter is slightly more robust, less parallel sided, and usually slightly more brownish than *leechi.* These differences are subtle enough in many specimens that determinations should not be considered definite without males.

This species is named in honor of Mr. Hugh B. Leech, of the California Academy of Sciences, San Francisco, because he collected all of the known specimens and also has collected great numbers of *Chaetarthria* for this study.

DISTRIBUTION: Trinity County, California.

HOLOTYPE: Male, Hayfork Creek at Hayfork-Wildwood Road, Trinity County, California, July 11, 1970, Hugh B. Leech (CA). Shape oval, rather parallel sided, fairly convex. Head black, punctation fairly coarse, extremely faintly micropunctate between the major punctures, labrum with many finer punctures, vestiture extremely fine and sparse. Pronotum, scutellum and elytra brownish black, diffusely paler at elytral apex sides of pronotum, pronotum with fairly sparse, fine punctation, extremely faintly micropunctate between the major punctures, vestiture sparse, elytral punctation much coarser, in alternate irregular and vaguely regular series, those of the irregular series bearing fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable for about two thirds of distance from apex to base. Ventral surface black except palpi, antennae, and legs from tip of femur outward dark reddish brown. Protibiae in anterior view widening sharply from base for about one third of length, then narrowing less sharply to apex, about three and one half times as long as greatest width, inner face of apical portion with series of flat, slanting plates very close together, nine on right protibia, eight on left. Aedeagus in dorsal view with parameres broad in basal two thirds, with bowed sides, apical third much narrower, tip pointed; filiform tip of penis visible between apices of parameres; basal piece elongate, narrower near juncture with parameres; in lateral view basal piece mostly hidden in abdomen of beetle (not fully dissected); entire paramere evenly bowed, forming a scoop shape. EL 1.75 mm., GW 1.54 mm., GH .88 mm., GW/EL .88, GH/EL .50, PL .39 mm.

FEMALE [based on specimen with same locality as holotype but collected on August 7, 1972, by Hugh B. Leech (CA); no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae and with no micropunctation between major punctures of head and pronotum.

VARIATION: The other specimens, although all taken at or near the type locality, are all appreciably larger than the holotype (elytral length over 2.0 mm.) and the males have more plates on the protibiae (nine or ten). Thus the holotype may be somewhat atypical. Since only one female is known it is not possible to state whether the absence of micropunctation on the head and pronotum is a consistent sexual difference.

PARATYPES (total 2 ♂♂): UNITED STATES: *California*: TRINITY CO.: Locality as holotype but August 7, 1972, 1 ♂, Hugh B. Leech (DM). Hayfork Creek just S. of its East Fork, 2700′, 1 ♂, August 9, 1972, Hugh B. Leech (CA).

Chaetarthria pusilla Sharp
(Figures 35, 36, 37, 38, 39, 43)

Chaetarthria pusilla Sharp, 1882, p. 88. Type locality: Guatemala City, Guatemala. Male type plus male paratopotype in British Museum (Natural History). Type examined by Mr. Harry Kenward and paratopotype by me for this study.

Chaetarthria minor Fall, 1901, p. 216. **NEW SYNONYMY**. Type localities: Riverside and Pasadena, California. Male and female cotypes in United States National Museum, examined by me for this study. Schwarz, 1914, p. 165 (possibly misidentified). Leech and Chandler, 1956, p. 343.

DIAGNOSIS: Throughout most of its range, the small size of this species (elytral length generally 0.9 to 1.3 mm.) separates it from all other dark species except very small specimens of *punctulata*, but the members of the *glabra* group, from Mexico and Central America, are within the same size range. *C. glabra* is dorsally very smooth, much less clearly punctate than *pusilla*, and the other species of its group which are as small as *pusilla* tend to be a lighter, more reddish brown than *pusilla*. However females should not be considered as being certainly identified when not accompanied by males unless they are from north of central Mexico.

DISTRIBUTION: Mendocino County, California, east to south eastern Texas (Blanco County) and south to Costa Rica.

MALE [based on specimen from 5 mi. SE. of El Progreso, El Progreso, Guatemala, August 11, 1965, Paul J. Spangler (USNM); this is the specimen which is closest to the type locality and which is suitable for describing since the male paratopotype which I have seen is missing its aedeagus]: Shape oval, rather parallel sided at middle, not very convex. Head black, punctation shallow, no micropunctation between major punctures, nearly glabrous. Pronotum, scutellum and elytra dark reddish brown, diffusely paler at sides of pronotum and elytral apex, pronotum very sparsely punctate, lacking micropunctation, vestiture very fine and sparse, elytral punctation thicker, coarser, but shallow, vestiture sparse and very fine, elytral apex lacking grooves or raised areas, sutural striae traceable for about two thirds of distance from apex to base. Ventral surface reddish brown with legs, antennae, palpi and prosternum yellowish brown. Protibiae in anterior view widening sharply from base for about one third of length and then inner margin bent so sides nearly parallel to apex, about five times as long as greatest width, inner face of apical portion with series of five flat, slanting plates very close together. Aedeagus in dorsal view with parameres narrowing rapidly from base to form a beak like structure at apex; filiform tip of penis visible between paramere tips; basal piece elongate, slightly wider near junction with parameres; in lateral view basal piece curved ventrally at base, with thin fin along ventral midline, about four times as long as parameres; parameres narrowing from base to apex, curved to form scoop-like structure.

FEMALE [based on specimen from near Pijijiapan, Chiapas, Mexico, July 5, 1965, Paul J. Spangler (USNM)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: This species includes rather distinct northern and southern groups of populations. The northern group ranges from northern California through Arizona and Texas and south to central Mexico, while the southern group ranges from southern Mexico through Central America (see map, figure 43). The northern group thus includes the cotypes of *minor* while the southern group includes the type of *pusilla*.

Specimens of the northern group average larger and slightly more parallel sided. They also have the aedeagus much narrower in dorsal view, the sides of the basal piece more sinuous, and the basal piece in lateral view slightly less curved dorsoventrally (figures 35 to 38). Although these differences might indicate that the two groups are separate species I have included both in *pusilla* because most specimens from Arizona, Texas, Sonora, and Nayarit are intermediate in size and proportions between typical northern and southern populations. Although the aedeagus of males from these localities looks more like the northern type, the ratio of paramere length/width basal piece[1] clearly shows that this organ also is intermediate; indeed the male cited below from southwest Texas has an aedeagus nearly, but not exactly, like that of the southern group while the aedeagus of the other male from that locality is missing. Thus there seems to be gene flow between northern and southern populations. Measurements of small samples of typical northern, intermediate northern, and southern populations are given below (figures are averages).

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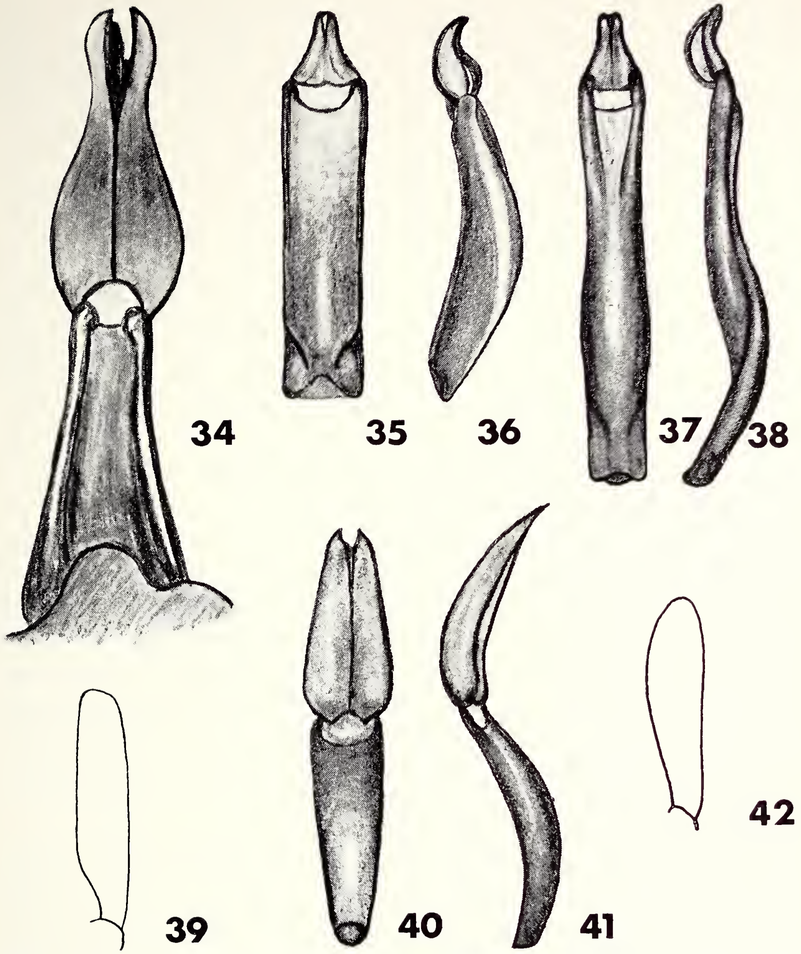
[1] Measured at narrow neck shortly behind juncture with parameres.

Locality	Sample Size	Elytral Length	Greatest Width / Elytral Length	Paramere Length / Width Basal Piece[1]
Typical Northern Populations				
Dry Creek, Mendocino Co., Calif.	2	1.18 mm.	.79	1.40
Bartlett Creek, Lake Co., Calif.	4	1.15 mm.	.82	1.39
San Carlos Bay, Sonora, Mexico	1	1.14 mm.	.81	1.50
Intermediate Northern Populations				
Alamos, Sonora, Mexico	2	1.16 mm.	.81	1.25
Acaponeta, Nayarit, Mexico	2	1.33 mm.	.82	1.33
Arizona (no further locality)	3	1.11 mm.	.81	1.20
Southwest Texas (no further locality)	1	1.14 mm.	.80	.91
Twin Sisters, Blanco Co., Texas	1	1.19 mm.	.88	1.11
Superior, Pinal Co., Arizona	6	1.11 mm.	.82	1.24
Southern Populations				
Tehuantepec, Oaxaca, Mexico	1	.95 mm.	.87	missing
Puente Nacional, Veracruz, Mexico	4	1.02 mm.	.88	.96
Lake Ilopango, La Libertad, El Salvador	4	1.04 mm.	.84	.92
Las Cañas, Guanacaste, Costa Rica	2	1.05 mm.	.80	.96

[1] Measured at narrow neck shortly behind juncture with parameres.

Since the aedeagus of most males from intermediate populations is most similar to that of the northern group, these populations have been included in the northern group in making the map (figure 43).

SPECIMENS EXAMINED: 163 males, 168 females, 7 not sexed. COSTA RICA: *Guanacaste*: Las Cañas, July. EL SALVADOR: *La Libertad*: Lake Ilopango, August. Río Majagual, July. GUATEMALA: *Alta Verapaz*: Cacao, Trece Aguas (♀ only). *El Progreso*: 5 mi. S. of El Progreso, August. San Agustin Acasaguastlan, August (♀ only). *Guatemala*: Guatemala City (paratype of *pusilla*). HONDURAS: *Choluteca*: 5 mi. E. of Choluteca, July. Pespire, July. *Comayuga*: Río Humuya, July. *Mexico*: *Baja California*: Hamilton Ranch, August (♀ only). *Baja California Sur*: 3 mi. NW. of Miraflores, Cañon San Bernardino, Boca de la Sierra, January (♀ only). *Chiapas*: near Pijijiapan, July (♀ only). *Morelos*: Cuautla, Sierra de Durango. MEXICO: Tejupilco, Temescaltepec, June. *Nayarit*: Acaponeta, August. *Oaxaca*: Tehuantepec, July. Zanatepec, June. *Sonora*: Alamos, August. San Carlos Bay, August. *Veracruz*: Puente Nacional, July. UNITED STATES: *Arizona*: PINAL CO.: Riverside. Superior, Boyce Thompson Arboretum, July, September (light trap). *California*: AMADOR CO.: Mokelumne Hill, July. COLUSA CO.: 1.5 mi. SW. of Lodoga, on road to Cooks Springs,



FIGS. 34–42. Fig. 34. *Chaetarthria leechi*, aedeagus, dorsal. Fig. 35. *C. pusilla*, southern group, aedeagus, dorsal. Fig. 36. same, lateral. Fig. 37. *C. pusilla*, northern group, aedeagus, dorsal. Fig. 38. same, lateral. Fig. 39. same, left protibia, anterior face. Fig. 40. *C. brasilia*, aedeagus, dorsal. Fig. 41. same, lateral. Fig. 42. same, left protibia, anterior face.

Indian Creek, April. LAKE CO.: Bartlett Springs, Bartlett Creek, August. 1.7 mi. W. of Kelseyville, Kelsey Creek at Gross Ford, May. LOS ANGELES CO.: Azusa, May. Los Angeles (♀ only). Pasadena, May, August (includes cotype of *minor*). Pomona. Saugus, Soledad Canyon, August. MARIN CO.: (♀ only). MENDOCINO CO.: Dry Creek, Highway 128. Covelo-Paskenta road, Williams Creek, August (♀ only). MONTEREY CO.: Lewis Creek, August. ORANGE CO.: Santa Ana. RIVERSIDE CO.: Palm Springs, March. Riverside (includes cotype of *minor*). San Jacinto Mountains. SAN BERNARDINO CO.: Hesperia, June (♀ only). San Bernardino, August. SAN DIEGO CO.: Mission Dam, September (♀ only). Oceanside, Camp Pendleton (♀ only). SAN LUIS OBISPO CO.: Nacimiento Reservoir, Bee Rock Campground, July (black light). SANTA BARBARA CO.: Santa Barbara (♀ only). SANTA CLARA CO.: Gilroy Hot Springs, September (♀ only). Mt. Hamilton, August. STANISLAUS CO.: 12 mi. W. of Patterson, Adobe Creek, April. TULARE CO.: Kaweah, April. *Texas*: "SW. Texas." BLANCO CO.: Twin Sisters, May. Females taken without males are only tentatively identified.

Chaetarthria brasilia, new species

(Figures 40, 41, 42, 62)

DIAGNOSIS: The combination of a shining, almost glabrous, dark dorsal surface and small size (elytral length generally 1.1 to 1.3 mm.) easily separates this species from any other known to me in South America. *C. granulata* is similar in size and color but is dull rather than shining dorsally due to the micropunctation of its head and pronotum. See also "Species A" under specimens of uncertain placement; these specimens lack the punctures of the apical half of the elytra seen in *brasilia* and are lighter in color.

DISTRIBUTION: Known only from Jacare, Xingu National Park, Matto Grosso, Brazil.

HOLOTYPE: Male, Jacare, Xingu National Park, Matto Grosso, Brazil, November 1965, at light, M. Alvarenga (USNM). Shape broadly oval, somewhat parallel sided, fairly convex. Head black, impunctate except several very tiny punctures on labrum, lacking micropunctation, glabrous. Pronotum, scutellum and elytra very dark reddish brown except narrowly and diffusely paler at sides of pronotum and elytral apex, smooth and shining, impunctate except some very shallow punctures on apical half of elytra, no micropunctation, glabrous except elytral punctures bearing a few very narrow, long hairs, these hairs widely separated but in definite longitudinal rows, elytral apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black with palpi, antennae and prosternum dark brown, legs dark reddish brown. Protibiae in anterior view widening gradually from base for slightly over half of length, then inner margin rounded so

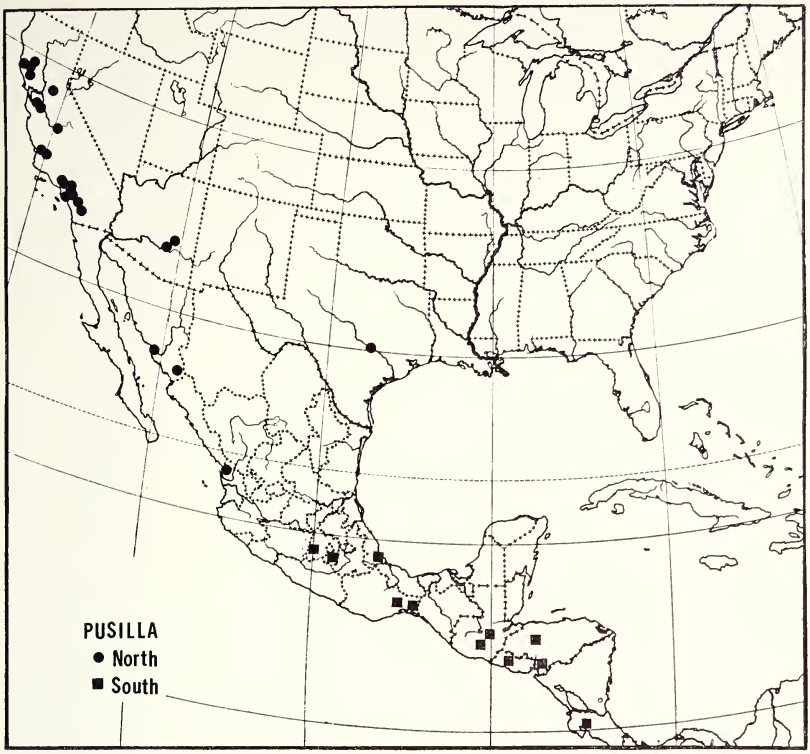


Fig. 43. Distribution of *Chaetarthria pusilla*.

sides converge gradually toward apex, about three times as long as greatest width, medial face of apical portion with two broad, flat, slanting plates on each protibia. Aedeagus in dorsal view with parameres together nearly forming a triangle, medial portion of tip of each paramere extended as small nipple; penis tip slender, visible between paramere tips; basal piece narrower than base of parameres at juncture with them, narrowing anteriorly; in lateral view basal piece only a little longer than parameres, slightly bowed so concave ventrally; parameres slightly concave dorsally, somewhat scoop-shaped. EL 1.10 mm., GW .95 mm., GH .56 mm., GW/EL .86, GH/EL .51, PL .21 mm.

Allotype: Female, same data as holotype (USNM). Externally like holotype except lacking secondary sexual modifications of protibiae. EL 1.24 mm., GW 1.02 mm., GH .68 mm., GW/EL .82, GH/EL .55.

VARIATION: No noticeable variation is present in the material.

PARATYPES: 37 ♂♂, 24 ♀♀, data as holotype (CNHM, DM, UMMZ, USNM).

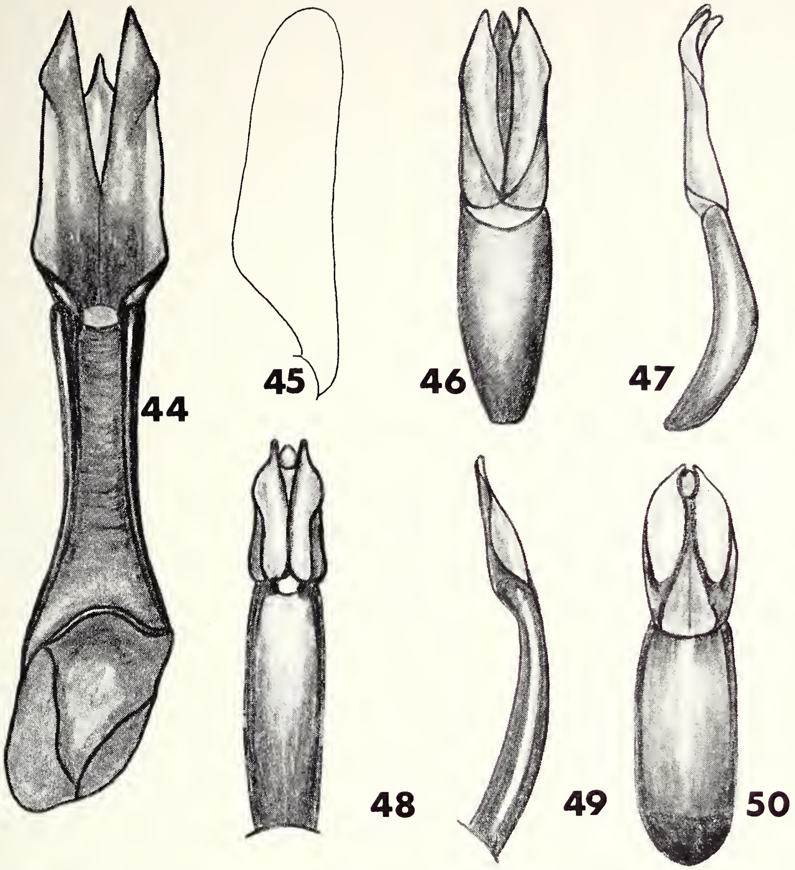
Chaetarthria lateralis, new species

(Figures 44, 45, 61)

DIAGNOSIS: The combination of large size (elytral length approximately 1.7 mm.) and black dorsum with distinct pale margins separates this species from any other known to me from South America. The coarse, closely set punctation of the dorsum and the nearly truncate elytral apex, in lateral view, are also unique.

DISTRIBUTION: Known only from near Temuco, Cautín, Chile.

HOLOTYPE: Male, 20 km. E. of Temuco, Cautín, Chile, January 8, 1951, Ross and Michelbacher (CA). Shape oval, somewhat parallel sided at middle, elytral apex somewhat attenuate, in lateral view not very convex, elytral apex bent sharply down so nearly perpendicular to venter, thus posterior appearing truncate. Head black, coarsely and thickly punctate, no micropunctation between major punctures, labral punctures finer, vestiture of head extremely sparse and fine. Pronotum, scutellum and elytra brown (specimen teneral, see section on variation), except yellow on pronotal margins except medial third of posterior margin, elytra yellow at about apical fifth and narrowly along sides, all yellow margins very distinct, pronotal punctation closely set but slightly finer than that of head, pronotum lightly micropunctate between major punctures, vestiture sparse and fine but thicker than that of head, elytral punctation coarse, irregular, most punctures bearing fine hairs pointing posteriorly, punctures forming rather regular longitudinal rows, apex of each elytron with five shallow grooves approaching the sutural stria, sutural striae traceable from apex nearly three quarters of way to base. Ventral surface dark brown with legs distad to tip of femur, palpi and antennae paler. Protibiae in anterior view widening sharply from base for nearly one fourth of length, then gradually narrowing toward apex, nearly four times as long as greatest width, inner face of apical portion with series of flat, slanting plates close together, ten on each protibia. Aedeagus in poor condition due to specimen being teneral, in dorsal view with parameres elongate, triangular, sharply pointed at apex; penis tip visible between parameres, broadly triangular with pointed apex; basal piece elongate; in lateral view basal piece somewhat concave ventrally, about one and one half times length of parameres; parameres concave dorsally, scoop-shaped.



FIGS. 44–50. Fig. 44. *Chaetarthria lateralis*, aedeagus, dorsal. Fig. 45. same, left protibia, anterior face. Fig. 46. *C. pallida*, western group, aedeagus, dorsal. Fig. 47. same, lateral. Fig. 48. *C. pallida*, central group, aedeagus, dorsal. Fig. 49. same, lateral. Fig. 50. *C. pallida*, Florida group, aedeagus, dorsal.

EL 1.66 mm., GW 1.26 mm., GH .84 mm., GW/EL .76, GH/EL .51, PL .35 mm.

ALLOTYPE: Female, same data as holotype (CA). Externally like male except darker portions of both dorsum and venter nearly black, and lacking secondary sexual modifications of protibiae. EL 1.72 mm., GW 1.31 mm., GH .86 mm., GW/EL .77, GH/EL .50.

VARIATION: The male holotype is somewhat paler than the female allotype and paratype, apparently due to being somewhat teneral. This is noticeable in the pronotal and elytral discs and the darker areas of the venter.

PARATYPE: 1 ♀, same data as holotype (DM).

Chaetarthria pallida (LeConte)

(Figures 46, 47, 48, 49, 50, 51)

Cyllidium pallidum LeConte, 1861, p. 342. Type locality: junction of Colorado and Gila Rivers, California. Type male in Museum of Comparative Zoology, Harvard University (Lectotype, designated by Miller, McCorkle, and Hatch, 1965, p. 46). Type reexamined by me for this study.

Cyllidium nigriceps LeConte, 1861, p. 342. Type locality: Lake Superior. Type female in Museum of Comparative Zoology, Harvard University. Type examined by me for this study. Placed in synonymy by Horn, 1873, p. 125.

Chaetarthria pallida: Horn, 1873, p. 125. Schwarz and LeConte, 1878, p. 439. Wickham, 1895, p. 185. Fall, 1901, p. 12, 216. Blatchley, 1910, p. 259; 1919, p. 320. Leng and Mutchler, 1918, p. 105. Young, 1954, p. 186. Leech and Chandler, 1956, p. 343. Richmond, 1962, p. 88. Miller, McCorkle, and Hatch, 1965, p. 46. Wooldridge, 1967, p. 430. Malcolm, 1971, p. 36.

DIAGNOSIS: This is the only dorsally yellowish species in North America in which the males have plates instead of stalked discs on the inner surface of the protibiae. Some females, however, are very difficult to separate from similar species, particularly *ochra* and light colored specimens of *bicolor*. Most specimens of *pallida* can be excluded from either of the species mentioned above by being from outside their geographical ranges, being micropunctate between the major punctures of the pronotum, or both. Specimens of *ochra* average appreciably larger than those of *pallida* (elytral length for *pallida* generally 1.1 to 1.6 mm. but usually under 1.5 mm. where sympatric with *ochra*, for *ochra* generally 1.6 to 1.8 mm.), and never have darkened or clouded areas on the pronotum, which *pallida* generally have. Specimens of *bicolor* average slightly larger than sympatric *pallida* (elytral length of *bicolor* where sympatric with *pallida* is generally 1.3 to 1.6 mm.), and are often more brownish on the elytra, *pallida* being more yellow. Also, the pronotal disc of *bicolor* is seldom appreciably darker than the elytral disc, a condition common in *pallida*. Additional species which may possibly be confused with *pallida* include the mexican *flava* and *spangleri*; the elytral length of *flava* is generally over 1.3 mm. and of *spangleri* generally

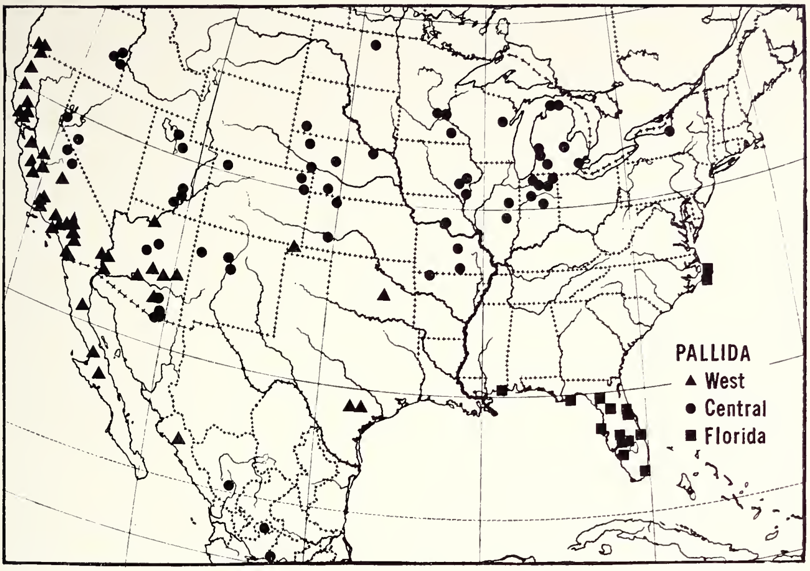


FIG. 51. Distribution of *Chaetarthria pallida.*

over 1.4 mm., and the range of *spangleri* seems to lie entirely south of that of *pallida.*

DISTRIBUTION: Throughout the United States, except not known north of central Oregon on the west coast, or of central New York on the east coast; in Mexico south to Aguascalientes and Durango. Also recorded from Ontario and/or Quebec, Canada (Wickham, 1895, p. 195), but I have not seen specimens from these areas.

MALE [based on holotype of *pallidum* (MCZ)]: Shape oval, fairly convex. Head black, shallowly punctate with no micropunctation between major punctures, labrum more finely and closely punctate, vestiture very sparse, labrum yellowish along margins. Pronotum, scutellum and elytra yellow except pronotal disc, scutellum and elytral humeri clouded with brown, pronotal punctation and vestiture sparse and very fine, no micropunctation between the major punctures, elytral punctation coarser but shallow, not evidently serial in arrangement but elytral apex with several shallow, longitudinal grooves, elytral vestiture of fine hairs more numerous than on pronotum, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except legs, prosternum, and antennal club yellowish brown, palpi, sides of third and fourth abdominal segments and remainder of antennae brown. Protibiae in anterior view widening from base for about half of length, then parallel sided to apex, about three and one half times as long as greatest width, medial face of apical portion with series of short, broad, flat, slanting plates, three on each protibia. Aedeagus in dorsal view with parameres narrow, elongate, parallel sided to apical third, then lateral margin of each paramere curving inward so apex is bluntly rounded; penis tip filiform, visible between parameres; basal piece elongate, nearly parallel sided; in lateral view basal piece bowed dorsally, rather flat, about one and one third times length of parameres; parameres thin, slightly bowed ventrally so scoop-shaped. EL 1.30 mm., GW 1.09 mm., GH .65 mm., GW/EL .84, GH/EL .50, PL .23 mm.

FEMALE [based on specimen from Wickenberg, Arizona, no further data (CA)]: Externally like male except paler parts of venter all yellowish, not brown, and lacking secondary sexual modifications of protibiae.

VARIATION: Included are three fairly distinct groups of populations which can be interpreted either as corresponding to the concept of subspecies, or as three distinct species. I have included all of them within *pallida* but have not used formal trinomials for them. This was done for the following reasons: the groups appear to be completely allopatric, except perhaps at Tucson, Arizona (but see further discussion under the central group); the central group has one of its normally distinctive characters, the micropunctation of the head and pronotum, absent in the southwestern part of its range, suggesting that gene flow occurs in this area between the central and western groups; and the male protibiae, which are distinctive in all other species of the genus in North America, are identical in all three groups. The aedeagus is also quite similar in all three groups, although in all males seen it can easily be placed to group.

Central Group: This group occupies most of the continental United States except for the west and south, extending south through Arizona and New Mexico to the states of Aguascalientes and Durango, Mexico (figure 51). The geographic relationship between this and the western group is rather complex. In Oregon and most of California they are separated by the Cascade and Sierra Nevada mountains, but in southern California this barrier breaks down and the western group extends eastward into southwestern Arizona. There are also two western group males from the Grand Canyon, suggesting that the western group extends north along the Colorado River. Specimens of the western group have also been taken in Texas and Oklahoma in areas of moderate elevation, so these populations may be continuous with the Arizona ones by way of areas of lower elevation between the mountains of southeastern Arizona, southern New Mexico, and adjacent Texas. In Arizona and New Mexico the central group appears to be limited to higher elevations, and it extends down the Sierra Madre Occidental at least as far as Guanajuato State, Mexico, where a single male has been taken. It is not, however, limited to higher elevations in other parts of its range. Further study could show that this is a case of ecological exclusion between two distinct species. Areas needing further study include Tucson, Arizona, where both groups have been collected (but I do not know enough about the exact collecting sites to know if they are truly sympatric there), and the Oklahoma-Kansas area where the two groups lie rather close together without any obvious ecological distinction between them.

Members of the central group average slightly larger than those of the western group (elytral length for the central group generally 1.3 to 1.6 mm., for the western group generally 1.1 to 1.4 mm.). The parameres are about .17 mm. long and the basal piece, if straightened out, would be about twice the length of the parameres. In their apical quarter the parameres narrow to a slight extension along the inner margins at the tip. The elytral apex is usually not or only very lightly grooved. In lateral view the beetle is not as convex as members of the Florida group (greatest height/elytral length ratio for central generally .47 to .55, for Florida generally .50 to .58). The pronotum is often clouded with brown but is seldom almost entirely dark, a condition common in members of the western group. Most specimens of the central group have the head, pronotum, and often anterior portions of the elytra strongly micropunctate between the major punctures, but west and south of Kansas and Nebraska this micropunctation is light to absent. Thus where the central and western groups lie close together the only reliable means of separating them is the length of the parameres and basal piece.

The type of *Cyllidium nigriceps* LeConte, collected at Lake Superior, belongs to this group (EL 1.31 mm., GW 1.10 mm., GH .70 mm., GW/EL .84, GH/EL .53). I have labeled members of the group "Cent." in collections.

Western Group: This group occupies Oregon and California west of the Cascade and Sierra Nevada mountains, extending east through extreme southern California and southwestern Arizona with specimens known from Texas and Oklahoma, and south through Baja California Sur and coastal Sonora, Mexico. See detailed discussion under the central group.

These beetles average slightly smaller than those of the central group (see measurements under that group) and are similar to the central group in greatest height/elytral length ratio thus being less convex than the Florida group specimens. The parameres are about .22 mm. long and the basal piece, if straightened out, would be no more than about 1.5 times the length of the parameres. The pronotum is almost always at least slightly darkened discally and sometimes it is nearly all very dark brown, except that the specimens from Oklahoma and all but one female from Texas show no pronotal darkening. The elytral apex is often fairly strongly grooved. There is no micropunctation between the major punctures on any part of the dorsum.

The lectotype of *Cyllidium pallidum* LeConte, collected at the junction of the Colorado and Gila Rivers, California, belongs to this group (designated lectotype by Miller, McCorkle, and Hatch, 1965, p. 46). I have labeled members of this group "West." in collections.

Florida Group: Occupies all of Florida and extends north to at least Rodanthe, North Carolina, and west at least to Horn Island, Mississippi. Outside of Florida all of the known collection sites are on islands near the coast, which suggests that the group prefers or at least tolerates slightly saline waters. All of the Floridian localities could possibly be in marshy areas but I have no information as to their salinity.

Beetles of this group average slightly smaller than those of the central group (elytral length for Florida generally 1.1 to 1.5 mm.) and somewhat more convex than those of either of the other groups (see data under central group). They are rather distinctive in being smooth and shining dorsally with very light punctation and no areas clouded or marked with brown. There is seldom any micropunctation between the major punctures dorsally and the elytral apex is never grooved. The parameres are about .17 mm. long and the basal piece, if straightened out, is about 1.5 times the length of the parameres. The paramere tips are fairly broad, and extended slightly along the medial margin. The general lack of dorsal surface sculpture and markings is a characteristic found in some beetles which frequent slightly saline waters, as for example *Berosus metalliceps* Sharp.

Young (1954, p. 186) refers to this group as possibly not belonging to the species *pallida*. I have labeled specimens of the group "Fla." in collections.

SPECIMENS EXAMINED: Central group, 163 males, 230 females, 15 not sexed. Western group, 271 males, 282 females. Florida group, 32 males, 51 females.

Central Group: MEXICO: *Aguascalientes*: Aguascalientes, August. *Durango*: 23 mi. S. of Durango, July. *Guanajuato*: San Miguel de Allende, 6397′, August. UNITED STATES: *Arizona*: COCHISE CO.: 5 mi. W. of Portal, South West Research Station, July (♀ only). San Pedro River, Charleston Crossing, March, April. Sierra Vista, Huachuca Mountains, October. MARICOPA CO.: July. PIMA CO.: Santa Catalina Mountains, February, May (♀ only). Tucson, August. SANTA CRUZ CO.: Nogales, August. YAVAPAI CO.: Jerome, August. Skull Valley, July. *Arkansas*: CARROLL CO.: Eureka Springs, April. *California*: INYO CO.: Bigpine, June. MONO CO.: Mono Lake, July. *Colorado*: LOGAN CO.: Iliff, South Platte River, September (♀ only). MOFFAT CO.: 2 mi. E. of Maybell, Deception Creek, 5910′. July. YUMA CO.: 32 mi. S. of Wray, South Fork Republican River, September (black light) (♀ only). *Illinois*: CHAMPAIGN CO.: Mahomet, Nettie Hart Woodland Memorial, June (black light). MOULTRIE CO.: 5 mi. E. of Sullivan, Kaskaskia River, July, August, September (at light). *Indiana*: LAPORTE CO.: July. MARION CO.: Indianapolis, Camp Belzer, August. MARSHALL CO.: June. POSEY CO.: June. STEUBEN CO.: May (♀ only). TIPPECANOE CO.: Lafeyette, July (♀ only). WHITLEY CO.: Loon Lake, August, September. *Iowa*: CEDAR CO.: May (♀ only). DES MOINES CO.: Burlington. JOHNSON CO.: Iowa City. *Kansas*: DECATUR CO.: 2560′ (♀ only). GRAY CO.: Cimarron, Arkansas River, August. *Michigan*: CHEBOYGAN CO.: July. Mullet Lake, Nigger Creek, July (♀ only). EMMETT CO.: Maple River at Brutus Road, T36N, R4W, Section 24–35, July (♀ only). KALAMAZOO CO.: Gull Lake Biological Station, July. MUSKEEGAN CO.: April (♀ only). SAGINAW CO.: Route 47 and Marsh Creek, May (silt river bank). WAYNE CO.: Detroit, June. *Minnesota*: HENNEPIN CO.: Excelsior. OLMSTEAD CO.: Rochester. RAMSEY CO.: St. Paul. *Missouri*: BOONE CO.: Columbia, Hinkson Creek, September. CRAWFORD CO.: 5 mi. W. of Steelville, Meramec River, October. RIPLEY CO.: 5.5 mi. N. of Briar, Buffalo Creek at Route C, August. *Nebraska*: GARDEN CO.: Oshkosh, North Platte River, September. HITCHCOCK CO.: Trenton, Republican River, September. KNOX CO.: 6 mi. S. of Niobrara, Verdigre Creek, June (in moist sand bank). SHERIDAN CO.: 14 mi. S. of Hay Springs, Niobrara River, September. THOMAS CO.: 2.5 mi. W. of Halsey, Nebraska National Forest, July. *Nevada*: MINERAL CO.: Hawthorn, July. ORMSBY CO.: Carson City, July. STOREY CO.: Virginia City, Six Mile Canyon, June (♀ only). *New Mexico*: BERNALILLO CO.: Albuquerque. MCKINLEY CO.: Coolidge. SANDOVAL CO.: Jemez Mountains, August. *New York*: CAYUGA CO.: Fair Haven, July. *North Dakota*: RAMSEY CO.: Mission Bay, Devil's Lake, August

(♀ only). *Oregon*: MALHEUR CO.: Juntura, June (edge of pond). Little Valley, September (margins of hot spring). Sucker Creek Canyon, June. *South Dakota*: FALL RIVER CO.: Angostura Dam, S. of Hot Springs, July. *Texas*: GILLESPIE CO.: Lange's Hill, June (♀ only). *Utah*: No further data ("U.T."). KANE CO.: Escalante River, mouth of Calf Creek, August. UTAH CO.: Utah Lake. WASHINGTON CO.: St. George, July (♀ only). WAYNE CO.: Hanksville, July (sand-oak area, light). 14 mi. S. of Hanksville, July (sand-oak area). WEBER CO.: Roy, July (light trap). *Wisconsin*: SHAWANO CO.: Cloverleaf Lakes, June, September (lakeshore flooding). Females not associated with males are only tentatively identified if they are sympatric with any similar species.

Western Group: MEXICO: *Baja California*: 31 mi. N. of El Arco, December. 2 mi. N. of El Pilar, Arroyo Colorado (♀ only). La Suerta, Sierra San Pedro Martir, 3700′, June (pool in canyon). *Baja California Sur*: San Ignacio, May (stream below dam). *Sonora*: Ciudad Obregon, Río Yaqui (♀ only). San Carlos Bay, August. UNITED STATES: *Arizona*: COCONINO CO.: Grand Canyon, July. GILA CO.: Globe, August. MARICOPA CO.: Gila Bend. Phoenix, July, August. PIMA CO.: Tucson, August. PINAL CO.: Riverside (♀ only). Superior, Boyce Thompson Arboretum, July, September. SANTA CRUZ CO.: Tumacacori Mountains, Yanks' Springs, Sycamore Canyon, August (♀ only). YUMA CO.: Ellenberg, September. Yuma ("Ft. Yuma"). *California*: FRESNO CO.: 4 mi. W. of Coalinga, dry bed Waltham Creek, August. 5.5 mi. SW. of Coalinga, Waltham Creek by Route 198, March. Mendota, April. KERN CO.: Wofford Heights, 2300′, June (at light) (♀ only). LAKE CO.: 1.7 mi. W. of Kelseyville, Kelsey Creek at Gross Ford, December. LOS ANGELES CO.: Azusa, May (♀ only). Pasadena (♀ only). Pico, February (♀ only). Rincon, San Gabriel River, 1800′, September. Saugus, Soledad Canyon, August. Tujunga Canyon, April, May (♀ only). Whittier Narrows Recreation Area, July. MARIN CO.: (♀ only). MENDOCINO CO.: 2 mi. N. of Calpella, Forsythe Creek, October (♀ only). Dry Creek, Highway 128, September (♀ only). South Eel River at confluence with Outlet Creek, Dos Rios Road, August. MONTEREY CO.: Bradley, Salinas River, March. Lewis Creek, August (♀ only). Soledad, August. NAPA CO.: 4 mi. N. of Lake Berryessa, Eticuera Creek, August (♀ only). Pope Creek at Walter Springs Road, August, 520′. ORANGE CO.: November (♀ only). PLACER CO.: Penryn (♀ only). RIVERSIDE CO.: Blythe, Columbia River, April. Elsinore, April. Palm Springs, April (♀ only). Riverside, Santa Ana River, December. SAN BERNARDINO CO.: Hesperia, June. near Victorville, Mojave River, February. SAN DIEGO CO.: Miramar, July. Mission Valley Gorge, April. San Diego, July (at light) (♀ only). San Mateo Canyon, October (berlese, under willow) (♀ only). SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, March (splashing water on sand). SANTA BARBARA CO.: Santa Barbara. SANTA CLARA CO.: Mt. Hamilton, August. SISKIYOU CO.: .7 mi. W. of Seiad, Klamath River, August. SONOMA CO.: Duncan Mills, June. Guerneville, May (♀ only). Rio Nido, July. TULARE CO.: Giant Forest, August (♀ only). 9.5 mi. N. of Kernville, Kern River, March. TRINITY CO.: .5 mi. E. of Hyampom, Hayfork Creek, July. *Oklahoma*: CIMARRON CO.: 25 mi. NW. of Boise City, Black Mesa State Park, S. end Lake Carl Etling, August. HUGHES CO.: Holdenville, July. *Oregon*: JACKSON CO.: Medford, July. JOSEPHINE CO.: 15 mi. SW. of Grants Pass, June. *Texas*: COLORADO CO.: Columbus, July, August. GONZALES CO.: Palmetto State Park, June. PRESIDIO CO.: 5 mi. SE. of Presidio, Alamito Creek, June (black light). Females without males are only tentatively identified.

Florida Group: UNITED STATES: *Florida*: DADE CO.: Biscayne. Biscayne Bay. DIXIE CO.: Old Town, July. FRANKLIN CO.: east end of Dog Island, April. HIGHLANDS CO.: near Avon Park, August. 1 mi. W. of Brighton, March. 6 mi. S. of Lake Placid, Archbold Biological Station, March. LEE CO.: Fort Meyers, March. MARION CO.: Dunnellon, July. PINELAS CO.: Dunedin, March. ST. LUCIEN CO.: Capron, March. SEMINOLE CO.: Sanford, February (black light). VOLUSIA CO.: Enterprise, April, June, December. *Mississippi*: JACKSON CO.: Horn Island. *North Carolina*: DARE CO.: Cape Hatteras, July. 1 mi. N. of Rodanthe, Cape Hatteras National Seashore, July. Females taken without males are considered to be certainly identified and thus not pointed out in the above list.

Chaetarthria pamphila d'Orchymont
(Figures 52, 53, 54, 61)

Chaetarthria pamphila d'Orchymont, 1939, p. 4, 6. Type locality: Corumba, Matto Grosso, Brazil. Type male in Institut Royal des Sciences Naturelles de Belgique. Type and two male paratypes examined by me for this study.

DIAGNOSIS: The elytral vestiture of flat scales nearly half as broad as long appears to be unique; in all other yellowish species known from South America the scales on the elytra are less than one third as broad as long. The vestiture of *pamphila* is often more evident than that of other species and usually has a greenish luster under oblique lighting. Also, *pamphila* is smaller than most other species likely to be confused with it (elytral length generally under 1.3 mm.), and more parallel sided. Some specimens of *C. argentina* are similar but *argentina* is generally more brownish dorsally than *pamphila*. For males the rounded basal portion of the parameres is diagnostic; females probably should not be determined with certainty if not taken with males.

DISTRIBUTION: Known only from Corumba, Matto Grosso, Brazil.

MALE [based on holotype male, Corumba, Matto Grosso, Brazil (RBM)]: Shape oval, parallel sided in about middle third, fairly convex. Head black, nearly lacking vestiture and punctation except labrum very finely punctate, no micropunctation between the major punctures. Pronotum, scutellum and elytra brownish yellow, pronotum very sparsely and shallowly punctate, no micropunctation between the major punctures, almost no vestiture, elytral punctation coarser but shallow, no evident serial arrangement, apex of each elytron with two slightly raised longitudinal areas, elytral vestiture of flattened scales about twice as long as broad, rather evident in oblique lighting, setae with a slightly greenish luster, sutural striae traceable about three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs and abdomen brownish yellow. Protibiae in anterior view widening from base for about half of length, then medial margin gradually curved so sides parallel to apex, about four times as long as greatest width, medial face of apical portion with a series of flat, slanting plates close together, five on each protibia. Aedeagus in dorsal view with parameres rounded at base, together forming nearly a circle, each paramere with narrow, parallel sided extension to apex, about as long as diameter of circle, apex of each paramere slightly pointed on outer margin; penis tip visible between paramere tips; basal piece with straight sides slightly convergent from juncture with parameres to base; in lateral view basal piece slightly bowed dorsally, about two and two thirds times length of parameres; parameres thin, nearly straight, slightly narrowing from base to apex. EL 1.21 mm., GW .98 mm., GH .67 mm., GW/EL .81, GH/EL .55, PL .16 mm.

FEMALE [based on specimen with same data as holotype (DM)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: There is little appreciable variation in the single known series except for some differences in color and punctation.

SPECIMENS EXAMINED: 19 males, 9 females, 1 not sexed (all type locality).

Chaetarthria hermani, new species
(Figures 55, 56, 61)

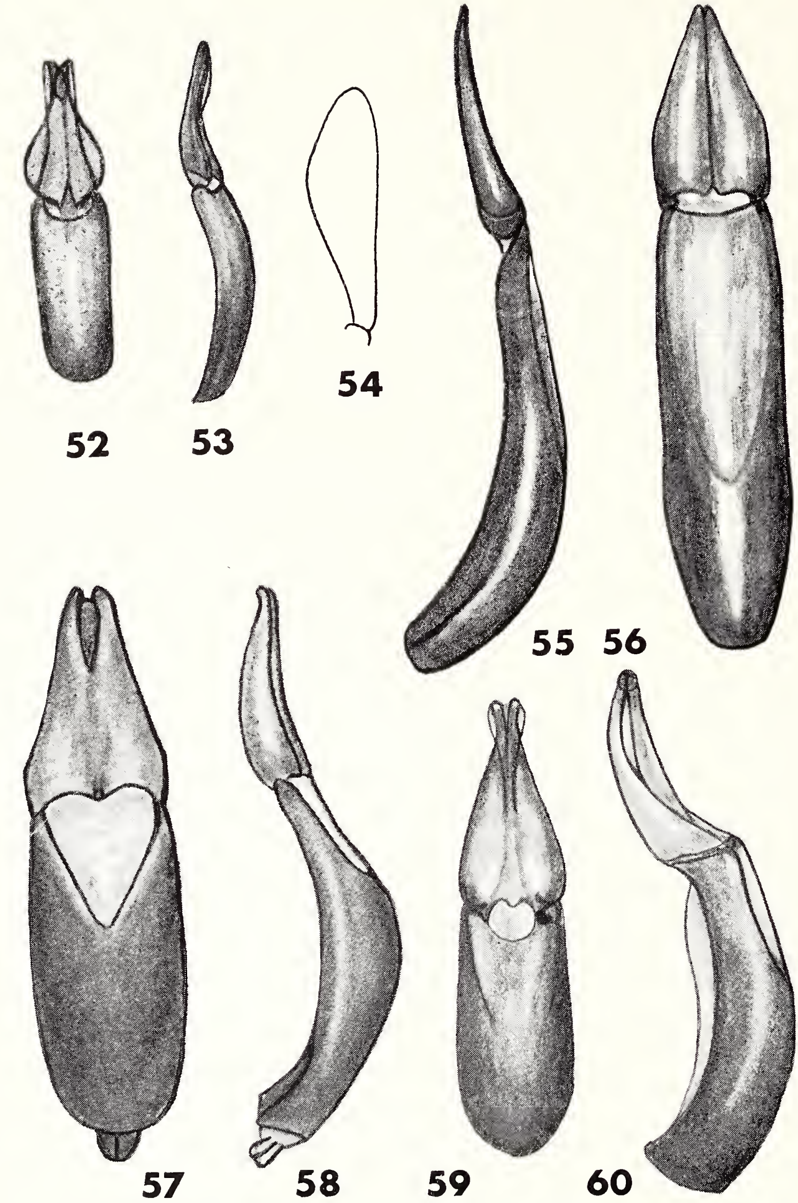
DIAGNOSIS: The dark brown pronotum and elytra are unique among species known from South America; the teneral holotype of *C. lateralis* is also dark brown but has a distinct pale margin, which *hermani* lacks. *C. granulata* is reddish brown and is strongly micropunctate on the head and pronotum; it also has much more evident dorsal vestiture than *hermani*. The aedeagus of *hermani* is similar to that of *argentina* but is more slender, with a longer basal piece. The elytra are generally 1.2 to 1.5 mm. long.

This species is named in honor of Dr. Lee Herman, of the American Museum of Natural History, who collected all of the known specimens and who has been very helpful to me during the final phases of this work.

DISTRIBUTION: Tucumán and La Rioja provinces, Argentina.

HOLOTYPE: Male, 7 km. W. of San Pedro de Colalao, Tucumán, Argentina, December 15, 1971, Lee Herman (AMNH). Shape oval, parallel sided in about middle third, somewhat convex. Head black, punctation and vestiture very sparse except labrum with many fine punctures, lacking micropunctation. Pronotum, scutellum and elytra dark reddish brown except pronotum with brownish lateral margins extending inward for short distance along anterior edge, pronotum nearly impunctate, lacking micropunctation, nearly glabrous, elytra lightly but fairly thickly punctate, punctation not evidently serial, each elytron with two slightly raised longitudinal areas at apex, elytral vestiture fairly thick and fairly evident in oblique lighting, shining against dark background, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface dark reddish brown except palpi, antennae, prosternum, legs, and abdomen yellowish brown. Protibiae in anterior view widening from base for about half of length, then nearly parallel sided to apex, about four times as long as greatest width, inner face of apical portion with series of flat, slanting plates, four plates on each protibia. Aedeagus in dorsal view with parameres together forming an elongate triangle with lateral margins slightly elbowed at about middle; penis not visible between parameres; basal piece long and nearly parallel sided; in lateral view basal piece slightly concave ventrally near base, thicker near base, if straightened out would be over two and one half times length of paramere; paramere a thin, long triangle. EL 1.47 mm., GW 1.12 mm., GH .75 mm., GW/EL .76, GH/EL .51, PL .23 mm.

ALLOTYPE: Female, same data as holotype (AMNH). Externally like holotype except lacking secondary sexual modifications of



FIGS. 52–60. Fig. 52. *Chaetarthria pamphila*, aedeagus, dorsal. Fig. 53. same, lateral. Fig. 54. same, left protibia, anterior face. Fig. 55. *C. hermani*, aedeagus, lateral. Fig. 56. same, dorsal. Fig. 57.

protibiae. EL 1.49 mm., GW 1.23 mm., GH .77 mm., GW/EL .82, GH/EL .52.

VARIATION: Except for moderate differences in punctation and vestiture the known specimens exhibit little variation.

PARATYPES (total 4 ♂♂, 5 ♀♀): ARGENTINA: *La Rioja*: 5 km. E. of Chilecito, 1500 m., 1 ♀, November 30, 1971, Lee Herman (AMNH). *Tucumán*: same data as holotype, 4 ♂♂, 4 ♀♀ (AMNH, DM).

Chaetarthria argentina, new species

(Figures 57, 58, 62)

DIAGNOSIS: The combination of small size (elytral length generally under 1.6 mm.), rather parallel sided outline and generally rather evident elytral vestiture separate this species fairly well from all other yellow to yellowish brown species in South America except *C. pamphila*, which is generally slightly lighter than *argentina* and a little more yellowish. Most of the known specimens of *argentina* were taken together with *goldbachi*, which is also somewhat more yellowish and slightly more rounded in outline. *C. hermani* is rather parallel sided, as is *argentina*, but is a slightly darker, less yellowish brown than *argentina*. It has a very similar aedeagus which differs by being more slender with a longer basal piece. The similarity of *argentina* to the darker *hermani* on the one hand and to the lighter *pamphila* on the other hand makes identification without examining the aedeagus uncertain. The elytral vestiture in *argentina* is fairly evident, much as in *pamphila*, but the individual scales are less than a third as broad as long as compared to nearly half as broad as long in *pamphila*.

DISTRIBUTION: Tucumán province, Argentina.

HOLOTYPE: Male, Concepción, Tucumán, Argentina, December 21 to 31, 1946, R. Goldbach (UT). Shape oval, parallel sided in about middle third, somewhat convex. Head black, punctation sparse except labrum with many fine punctures, lacking micropunctation, vestiture fairly thick. Pronotum, scutellum and elytra yellowish brown, pronotal punctation very sparse, lacking micropunctation, vestiture moderately thick, elytral punctation coarser and thicker, not evidently serial, each elytron with two slightly raised longitudinal areas near apex, elytral vestiture moderately thick and fairly evident in oblique lighting, sutural striae traceable for nearly three quarters

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C. argentina, aedeagus, dorsal. Fig. 58. same, lateral. Fig. 59. *C. pamphiloides*, aedeagus, dorsal. Fig. 60. same, lateral.

of way from apex to base. Ventral surface dark brown except legs, antennae, palpi, and metasternum yellow, abdomen yellowish brown. Protibiae in anterior view widening sharply from base for about half of length, then narrowing toward apex, slightly less than four times as long as greatest width, medial face of apical portion with series of flat, slanting plates, five on each protibia. Aedeagus with parameres in dorsal view forming an elongate triangle with lateral edges curved slightly near base; penis triangular with tip visible extending between tips of parameres; basal piece elongate and nearly parallel sided; in lateral view basal piece rather humped dorsally, slightly concave ventrally, if straightened out would be slightly over one and one half times length of parameres; parameres flat, very slightly bowed ventrally. EL 1.40 mm., GW 1.16 mm., GH .70 mm., GW/EL .83, GH/EL .50, PL .21 mm.

FEMALE [based on specimen with same data as holotype (UT), no allotype designated]: Externally like holotype except lacking secondary sexual modifications of protibiae.

VARIATION: Aside from some difference in punctation and vestiture, there is little known variation. The single male from near San Pedro de Colalao was taken with *hermani* and is slightly lighter than those from Concepción, suggesting the possibility of character displacement caused by the presence of the darker *hermani*, but certainly no definitive statement can be made on the basis of one specimen. Alternatively, it is possible that *hermani* and *argentina* are not separate species, as the differences in color, protibiae and aedeagus are slight and could be interpreted as geographic variation were it not for the presence of both types near San Pedro de Colalao.

PARATYPES AND FEMALES (total 107 ♂♂, paratypes, 79 ♀♀, not paratypes): ARGENTINA: *Tucumán*: 105 ♂♂, 78 ♀♀, data as holotype (AMNH, CA, CNC, CNHM, BM, DM, IU, RBM, USNM, UT). No further locality, 1 ♂, January 1956, R. Goldbach (UT). 7 km. W. of San Pedro de Colalao, 1 ♂, December 15, 1971, Lee Herman (AMNH).

Chaetarthria pamphiloides d'Orchymont
(Figures 59, 60, 62)

Chaetarthria pamphiloides d'Orchymont, 1939, p. 4, 6. Type locality: Río Alto Parana, Paraguay. Type (? see section on variation) plus male paratype in Institut Royal des Sciences Naturelles de Belgique. Paratype examined by me for this study.

DIAGNOSIS: Males of this species can be easily identified by the elongate, narrow tips of the parameres but females are not apparently

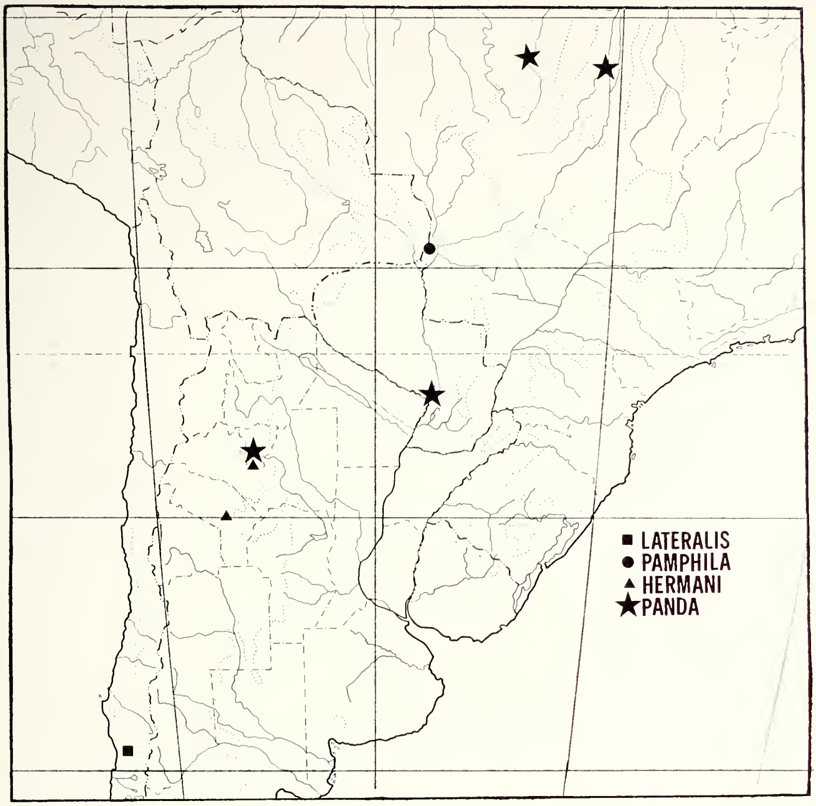


FIG. 61. Distribution of *Chaetarthria lateralis*, *C. pamphila*, *C. hermani* and *C. panda*.

distinguishable from any of the remaining four species of the group. See further comments in the section on variation.

DISTRIBUTION: Known certainly only from Río Alto Parana, Paraguay and Goias state, Brazil, and possibly from Alagoas state, Brazil.

MALE [based on paratype, Río Alto Parana, Paraguay, February, 1937, Ihamisi (RBM)]: Shape oval, somewhat parallel sided at middle. Head black, shining, nearly impunctate except fine punctures on labrum, lacking micropunctation, nearly glabrous. Pronotum, scutellum and elytra slightly brownish yellow, pronotum shining, glabrous, without major punctation or micropunctation, elytral punctation very shallow, vestiture of fine hairs not easily seen, elytral apex

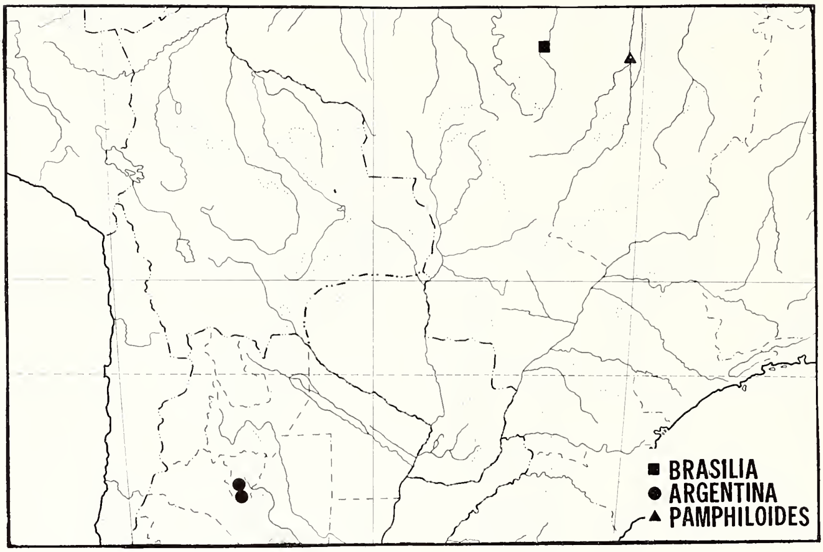


FIG. 62. Distribution of *Chaetarthria brasilia*, *C. argentina* and *C. pamphiloides*.

with four very light striae on each elytron, sutural striae traceable about two thirds of way from apex to base. Ventral surface black except prosternum, legs, antennae, and palpi yellow, abdomen dark brown. Protibiae in anterior view widening from base for about half of length, then inner margin elbowed so parallel sided to apex, about three and one half times as long as greatest width, medial face of apical portion of each protibia with series of seven narrow, slanting plates very close together. Aedeagus in dorsal view with parameres narrowing gradually and evenly from base to near apex but apex attenuate; tip of penis slender; basal piece elongate and nearly parallel sided, slightly broader anteriorly than at juncture with parameres; in lateral view basal piece slightly concave ventrally, nearly one and one half times length of parameres; parameres slightly concave dorsally.

FEMALE: Not certainly known (see section on variation).

VARIATION: The type and paratype are the only specimens known which certainly belong to this species (see final paragraph below) but a male from Rio Araguaia, Ilha do Bananal, Santa Isabel, Goias, Brazil [August 12 to 22, 1957, Borys Malkin (CA)] has genitalia identical to the paratype. It is more brownish, has the head and pronotum strongly micropunctate between the major punctures, has the only remaining protibia somewhat less sharply elbowed on the inner margin, has only six protibial plates, and is about one quarter smaller. Since both size, and micropunctation of the head and pronotum can vary within species (for example *pallida*), and since the aedeagus and probably the protibiae are within a reasonable range of variation, I include the specimen under *pamphiloides* (labeling it "? *pamphiloides*").

There is also a female from Cachoeira Paulo Affonso, Alagoas, Brazil, [March 24, 1936, Schubart (RBM)] which d'Orchymont had before him at the time of his original description, but then referred to in a later paper (1943, p. 64) as "? *pamphiloides*." The specimen is essentially identical to the male paratype except lacking the secondary sexual modifications of the protibiae, but I am not able to separate females of the various yellowish South American species so am uncertain as to what species this represents.

In d'Orchymont's original description he mentions only a type and a female, but the male I have seen from the Institut Royal des Sciences Naturelles de Belgique is labeled "paratype."

Chaetarthria panda d'Orchymont
(Figures 61, 63, 64, 65)

Chaetarthria panda d'Orchymont, 1939, p. 4, 7. Type locality: Río Alto Parana, Paraguay. Type male (? see section on variation) plus male paratype in Institut Royal des Sciences Naturelles de Belgique. Male paratype examined by me for this study.

Chaetarthria panthea d'Orchymont, 1939, p. 4, 7. Type locality: Tucumán Province, Argentina. Type male in Institut Royal des Sciences Naturelles de Belgique, examined by me for this study. **NEW SYNONYMY.**

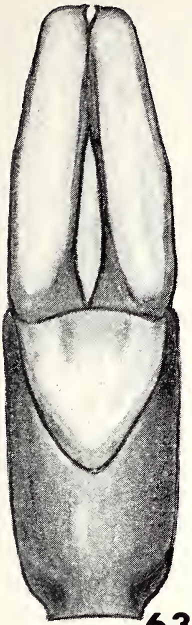
DIAGNOSIS: The form of the aedeagus is diagnostic but must be used with caution because if it is subject to drying the edges of the parameres will often curl dorsally, changing the apparent shape (see section on variation). *C. malkini* has a similar aedeagus but is smaller (elytral length generally under 1.4 mm. compared to generally over 1.5 mm. for *panda*) and has the male protibiae elbowed about one third of the way from the base as compared to about half of the way for *panda*. The aedeagus of *goldbachi* is also similar in shape but the parameres are less membranous dorsally. Females can not be distinguished with certainty from those of related species.

DISTRIBUTION: Tucumán Province, Argentina, north to the state of Matto Grosso, Brazil; probably also in Uruguay and Peru.

MALE [based on paratype, Río Alto Parana, Paraguay (RBM)]: Shape oval, somewhat parallel sided at middle, somewhat convex. Head black, major punctures fairly coarse but sparse, with evident micropunctation between the major punctures, labrum finely and thickly punctate, little evident vestiture. Pronotum, scutellum and elytra slightly brownish yellow, pronotum sparsely provided with major punctures but micropunctation evident in some areas, little evident vestiture, elytra with major punctures larger, shallow, not evidently serially arranged, lacking micropunctation, apex of each elytron with two very slightly raised longitudinal areas but no apical grooves, vestiture moderately thick but not very evident, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except legs, palpi, antennae, prosternum and apical half of abdomen yellowish brown. Protibiae in anterior view widening sharply from base for about half of length, then inner margin curved so margins slightly convergent to apex, about four times as long as greatest width, medial face of apical portion with series of flat, slanting, narrow plates close together, eight on each protibia. Aedeagus in dorsal view with parameres nearly rectangular and truncate at tip except that in drying lateral margins of apical portion have curled so apical portion looks narrower (see section on variation), most of center of dorsum of each paramere membranous; penis not visible; basal piece elongate, parallel sided; in lateral view basal piece concave ventrally, about one and one half times length of parameres if straightened out; parameres thin and nearly flat.

FEMALE [based on specimen from Jacare, Xingu National Park, Matto Grosso, Brazil (DM)]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: The specimens from Santa Isabel, Rio Araguaia, Matto Grosso, Brazil and the single female from Montevideo, Uruguay are paler and less brownish and the Montevideo specimen has the elytral humeri and punctures marked with dark brown (it is only tentatively identified as this species). The aedeagus varies much more in size than that of most species, that of males from Matto Grosso having a paramere length of about .35 mm. while the paratype from Río Alto Parana and the specimens from Argentina have a paramere length of about .28 mm. The tips of the parameres of specimens from Brazil tend to curl laterally on drying, thus making the apical portion of the parameres appear narrower and less truncate; this does not occur in Argentine specimens. This caused d'Orchymont to consider the Argentine material to be a separate species, *C. panthea* (compare figures 5 and 6 in d'Orchymont 1939, and figures 63, 64



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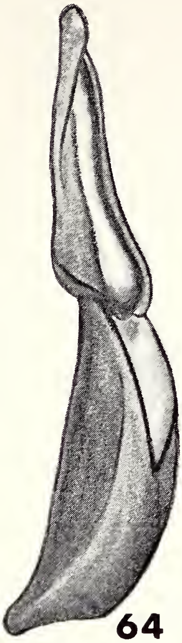

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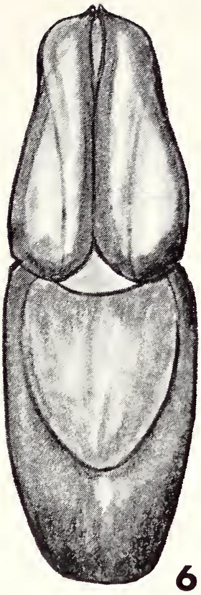

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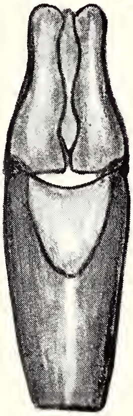

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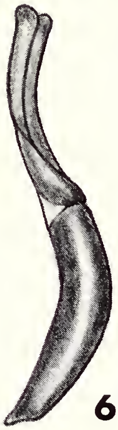

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Figs. 63–67. Fig. 63. *Chaetarthria panda*, aedeagus curled on drying (specimen from Brazil), dorsal. Fig. 64. same, lateral. Fig. 65. same, aedeagus not curled on drying (specimen from Argentina), dorsal. Fig. 66. *C. malkini*, aedeagus, dorsal. Fig. 67. same, lateral.

and 65 in this work). He also pointed out that the Argentine specimens lack micropunctation of the head and pronotum. These differences are consistent with the idea that this is a single, geographically variable species, so I have considered *panthea* to be a synonym of *panda*.

C. panda is sympatric with *malkini* and *goldbachi* at Santa Isabel, Matto Grosso, and with *goldbachi* at Jacare, Xingu National Park, Matto Grosso, so all three appear to be separate species although the differences between them are not very great.

Although d'Orchymont's original description (1939) mentions only the single male holotype plus the female from Montevideo, the topotypic male I have seen is labeled paratype.

Specimens Examined: 58 males, 78 females. Argentina: *Tucumán*: No further locality (holotype of *panthea*, RBM). Concepción, December. Brazil: *Goias*: Santa Isabel, Rio Araguaia, Isla do Bananal, October or November (♀ only). *Matto Grosso*: Jacare, Xingu National Park, November (at light). Rio Araguaia, Santa Isabel, August. Paraguay: Río Alta Parana, February. *Asunción*: 2 km. north of Luque, June. Peru: *Lima*: Mouth of Río Rimac, close to Pacific, June (♀ only). Uruguay: *Cancelones*: Montevideo (♀ only). Females taken without males are only tentatively identified.

Chaetarthria malkini, new species

(Figures 66, 67, 68)

Diagnosis: The aedeagus of this species is diagnostic but that of *panda* is similar although larger (paramere length for *malkini* usually .21 to .23 mm., for *panda* usually .26 to .38 mm.). The elytral length of *malkini* is generally under 1.4 mm. while that of *panda* is generally over 1.5 mm.; the male protibia of *panda* has the elbow at about the middle while in *malkini* it is about one third of the way from the base. *C. goldbachi* also has a similar aedeagus in which the parameres are less membranous dorsally and their sides are more sinuate so that the tip is attenuate. The elytral length is rather variable.

Females are difficult to identify. All three species mentioned above have been collected at Santa Isabel, Matto Grosso; in that series *panda* females are larger than the other two species and they have micropunctation on the head and pronotum. Females of *goldbachi* and *malkini* are smaller, *malkini* being slightly lighter in color and more robust than *goldbachi*, while *goldbachi* is micropunctate on the head and pronotum and *malkini* is not. These differences,

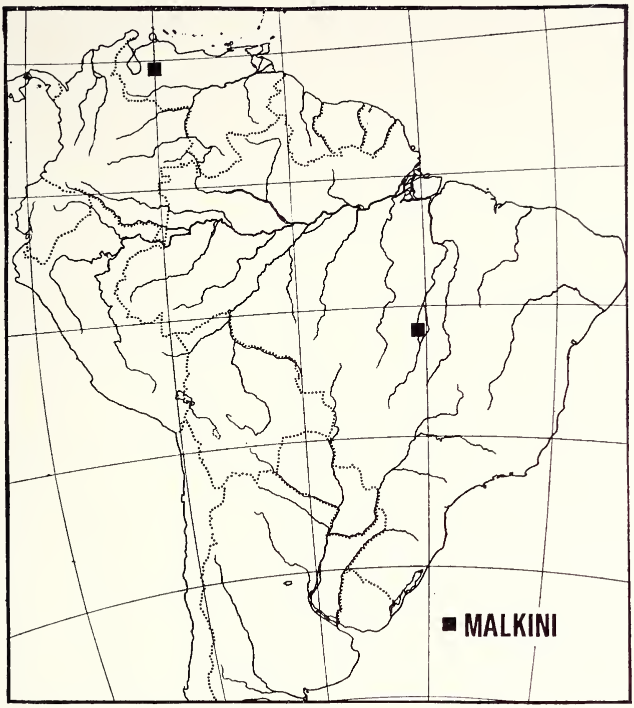

FIG. 68. Distribution of *Chaetarthria malkini.*

however, do not hold up for collections of each of these species by itself in other areas (see section on variation for each species).

This species is named for Mr. Borys Malkin, who collected all of the known specimens as well as specimens of several other species from South America.

DISTRIBUTION: Santa Isabel, on border of Matto Grosso and Goias, Brazil, and Portugesa Province, Venezuela.

HOLOTYPE: Male, Santa Isabel, Matto Grosso side of Rio Araguaia, Brazil (CA). Shape oval, somewhat convex. Head black, nearly glabrous and impunctate except labrum with many small punctures, no micropunctation. Pronotum, scutellum and elytra slightly brownish yellow, pronotum shining, with only a few scattered hairs and a few scattered punctures, no micropunctation, elytral punctures more numerous and larger, but shallow, not evidently serial, vestiture fairly thick but not evident, apex of each elytron with two slightly raised longitudinal areas, sutural striae traceable nearly three fourths of way from apex to base. Ventral surface of head black except antennae and palpi yellowish, rest of venter dark reddish brown except prosternum and legs yellowish. Protibiae in anterior view widening sharply from base for about one third of length, then inner margin bent so sides nearly parallel to apex, about three and one half times as long as greatest width, medial face of apical portion with series of flat, slanting plates close together, six on each protibia. Aedeagus in dorsal view with parameres elongate, nearly rectangular but slightly narrower at the tip, membranous on much of center of dorsum of each paramere; penis not visible; basal piece parallel sided, not very long; in ventral view slightly concave ventrally, about one and one half times length of parameres; parameres thin and slightly concave dorsally. EL 1.26 mm., GW 1.02 mm., GH .60 mm., GW/EL .81, GH/EL .47, PL .21 mm.

FEMALE [based on specimen with same data as holotype (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: There is minor variation in punctation, color, and presence of very slightly raised longitudinal areas on the elytral apex. The number of plates on the male protibiae varies from six to nine, a wider range than found in most species.

PARATYPES AND FEMALES (total 21 males, paratypes, 17 females, not paratypes): BRAZIL: *Goias*: Santa Isabel, Rio Araguaia, Ilha do Bananal, 1 ♂, July 15 to 22, 1957, Borys Malkin (CA). *Matto Grosso*: Rio Araguaia, Santa Isabel, 19 ♂♂, 17 ♀♀, August 10 to 20, 1957, Borys Malkin (CA, DM). VENEZUELA: *Portugesa*: Guanare, 1 ♂, September 10 to 13, 1957, Borys Malkin (CA).

Chaetarthria goldbachi, new species
(Figures 69, 70, 76)

DIAGNOSIS: The aedeagus is diagnostic, but somewhat similar to that of *malkini* and *panda*; see the diagnoses of those species for further comment. The aedeagus of *bruchi* is also similar but has the tips of the parameres more truncate and the basal piece more elongate and less bulbous anteriorly.

Females are difficult to separate from related species. The diagnosis of *malkini* gives characters which separate it from *goldbachi* where they have been taken together. Where it occurs with *argentina*, at Concepción, Tucumán, Argentina, *goldbachi* averages larger (elytral length generally over 1.6 mm. as compared to generally under 1.5 mm. for *argentina*), a little more rounded in outline, and slightly more yellowish dorsally with the elytral vestiture not as evident.

C. bruchi also occurs in Tucumán Province and I am unable to separate females of that species from those of *goldbachi.*

This species is named in honor of Dr. R. Goldbach, who collected the largest series of specimens of it.

DISTRIBUTION: Matto Grosso and Goias, Brazil, Portugesa, Venezuela, and Tucumán, Argentina.

HOLOTYPE: Male, Concepción, Tucumán, Argentina, December 21 to 31, 1946, R. Goldbach (UT). Shape broadly oval, somewhat convex. Head black, punctation sparse and shallow except labrum with many fine punctures, lacking micropunctation between the major punctures, vestiture very sparse. Pronotum, scutellum and elytra slightly brownish yellow with elytral humeri marked with brown, pronotal punctation sparse and shallow, surface shining, lacking micropunctation, vestiture extremely sparse, elytral punctation somewhat deeper, punctures more numerous, not evidently serial but elytral apex with five very shallow, short, longitudinal grooves on each elytron, vestiture fairly thick but not evident, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum and legs brownish yellow, abdomen dark brown but paler at sides. Protibiae in anterior view widening sharply from base for about half of length, then inner margin bent so sides slightly convergent to apex, about three and one half times as long as greatest width, medial face of apical portion with series of flat, slanting plates close together, ten on each protibia. Aedeagus in dorsal view with parameres elongate, rounded at tip with apex slightly pointed, slightly sinuate a little more than a third of way from tip, paramere dorsum membranous only on apical portion; penis tip just visible between parameres back of tip; basal piece bulbous at anterior end; in lateral view basal piece thick, somewhat concave ventrally, about one and one half times length of parameres; parameres thick at base, narrowing to apex, concave dorsally so scoop-shaped. EL 1.66 mm., GW 1.31 mm., GH .79 mm., GW/EL .79, GH/EL .46, PL .33 mm.

FEMALE [based on specimen with same data as holotype (UT), no allotype designated]: Externally like male except lacking secondary sexual modification of protibiae.

VARIATION: Minor variation occurs in coloration, darkening of elytral humeri, tendency for attenuation of elytral apex, and punctation. In addition, the material included here represents two rather different groups of specimens which could possibly be different species. The specimens from Argentina average larger (elytral length generally over 1.6 mm.), darker in color, lack micropunctation on the head and pronotum and have the tips of the parameres broader and less attenuate. Those from Brazil and the single specimen from Venezuela are smaller (elytral length generally under 1.4 mm.), more yellowish dorsally (although some specimens are as dark as those from Argentina), have the head and pronotum variable from very indistinctly to quite clearly micropunctate, the tips of the parameres narrower and more attenuate, and the elytral apex sometimes somewhat attenuate. These slight differences all appear consistent with the idea that this is a single, geographically variable species.

PARATYPES AND FEMALES (total 110 males, paratypes, 140 females, not paratypes): ARGENTINA: *Tucumán*: Concepción, 74 ♂♂, 80 ♀♀, December 21 to 31, 1946, R. Goldbach (AMNH, BM, CA, CNC, CNHM, DM, IU, RBM, USNM). 7 km. W. of San Pedro de Colalao, 4 ♂♂, December 15, 1971, Lee Herman (AMNH). BRAZIL: *Goias*: Santa Isabel, Ilha do Bananal, Rio Araguaia, 1 ♂, August 10 to 20, 1957, Borys Malkin (CA). *Matto Grosso*: Santa Isabel, Rio Araguaia, 25 ♂♂, 44 ♀♀, July 12 to 22, 1957, Borys Malkin (CA, DM). Jacare, Xingu National Park, 5 ♂♂, 16 ♀♀, November 1965, Alvarenga and Werner (at light) (CNHM, IU, USNM). VENEZUELA: *Portugesa*: Guanare, 1 ♂, September 10 to 13, 1957, Borys Malkin (CA).

Chaetarthria bruchi Balfour-Browne
(Figures 71, 72, 93)

Chaetarthria bruchi Balfour-Browne, 1939, pp. 300–301. Type locality: Tucumán (city or province ?), Argentina. Type male and allotype female in British Museum (Natural History). Type not examined for this study.

DIAGNOSIS: The aedeagus is diagnostic due to the truncate tips of the parameres; several other species have a similar aedeagus which is more or less rounded at the tip. Females are very similar to those of other species in Argentina, particularly *C. goldbachi*, and should not be identified without reference to accompanying males. The elytral length is usually 1.5 to 1.7 mm.

DISTRIBUTION: Tucumán and Córdoba provinces, Argentina.

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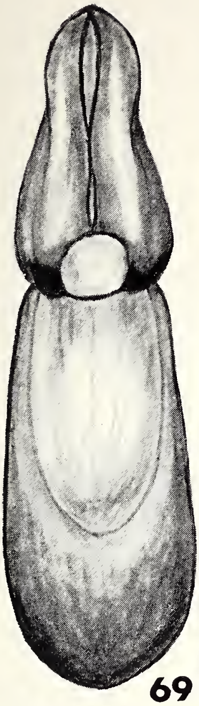
FIG. 69–75. Fig. 69. *Chaetarthria goldbachi*, aedeagus, dorsal. Fig. 70. same, lateral. Fig. 71. *C. bruchi*, aedeagus, dorsal. Fig. 72. same, lateral. Fig. 73. *C. spangleri*, left protibia, anterior face. Fig. 74. same, aedeagus, dorsal. Fig. 75. same, lateral.



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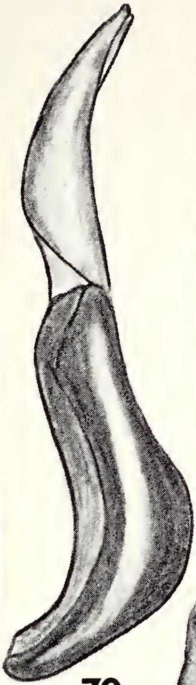

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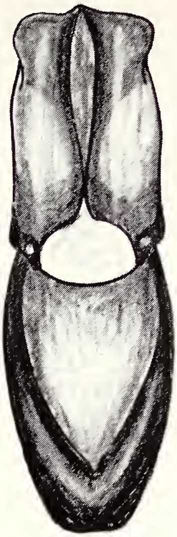

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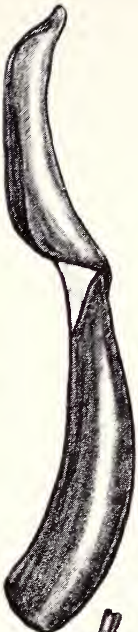

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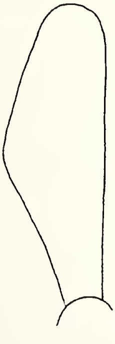

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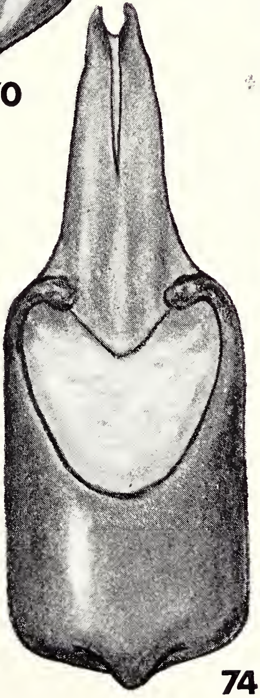

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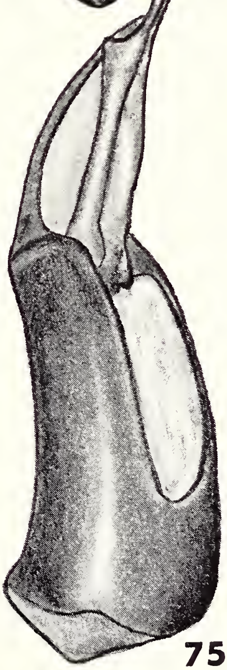

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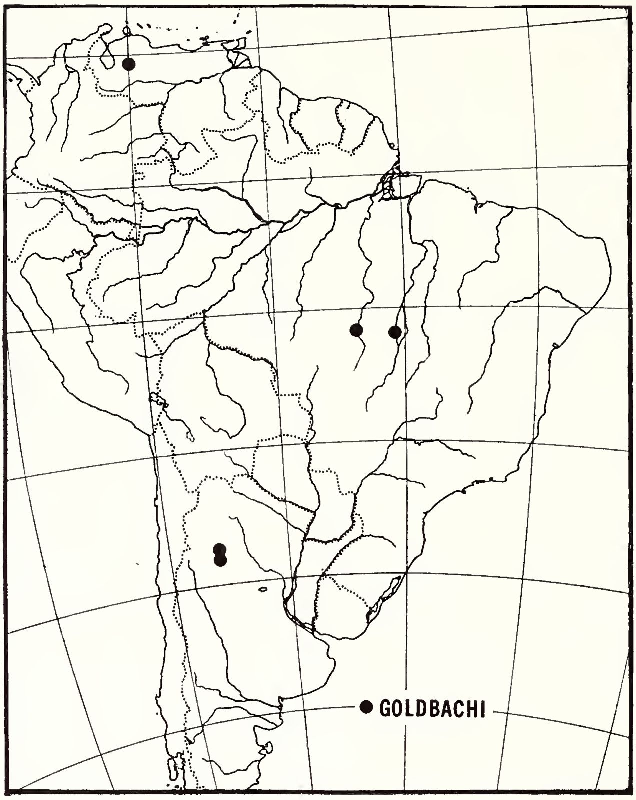


FIG. 76. Distribution of *Chaetarthria goldbachi.*

MALE [based on specimen, Río Cosquín, Cosquín, Córdoba, Argentina, November 28, 1971, Lee Herman (AMNH)]: Shape broadly oval, somewhat convex. Head black, punctation moderately coarse but rather sparse, lacking micropunctation between major punctures, labrum with many small punctures, vestiture very sparse. Pronotum, scutellum and elytra light brownish yellow with pronotal disc and elytral humeri darker, pronotum nearly impunctate, lacking micropunctation, with little vestiture, elytra rather thickly provided with shallow punctures not evidently serial, apex of each elytron with two slightly raised longitudinal areas, vestiture fairly thick but not very evident, sutural striae traceable for nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum and legs yellowish. Protibiae in anterior view widening sharply from base for about half of length, then inner margin bent so sides roughly parallel to apex, about three and one half times as long as greatest width, medial face of apical portion with a series of flat, slanting plates close together, six on each protibia. Aedeagus in dorsal view with parameres elongate, parallel sided except slightly indented at sides about one third of way from apex, apex sharply truncate, inner margin of each paramere extending forward as a small nipple; penis not evident; basal piece elongate, evenly narrowing anteriorly; in lateral view basal piece fairly slender, concave ventrally, over one and one half times length of parameres if straightened out; parameres thin and scoop shaped.

Female [based on specimen with data as male above (AMNH)]: Externally like male except slightly darker dorsally so that golden elytral vestiture slightly more evident against darker elytra, pronotum very lightly micropunctate between major punctures, and lacking secondary sexual modifications of protibiae.

Variation: There is considerable variation in the amount of brown in the dorsal color. Some specimens are quite brownish over the entire dorsum while others have at least the elytra lighter yellow but the humeri and scutellum dark, and still others are lighter yellow over the entire dorsum (except that the head is always black). In darker specimens the elytral vestiture is more evident against the darker background. Only a few specimens show any trace of micropunctation on the head and pronotum (referred to as reticulation in Balfour-Browne's original description). The shape of the membranous area between parameres and basal piece in Balfour-Browne's drawing of the aedeagus shows that this is a ventral view, not dorsal as labeled.

Specimens Examined: Total 22 males, 45 females. Argentina: *Córdoba*: Cosquín, Río Cosquín, November. *La Rioja*: 5 km. E. of Chilecito, 1500 m., November. *Tucumán*: January. 7 km. W. of San Pedro de Colalao, December. *Province?*: Pampa Grande (♀ only). The female taken without males is only tentatively identified.

THE SPANGLERI GROUP

Diagnosis: Dorsal surface yellow to nearly black, head black; protibiae of males elbowed or with rounded angle on inner margin (fig. 73), medial or posterior face of apical portion with two to five stalked discs (fig. 80); male metasternum without larger bristles; parameres, taken together, slightly to much longer than wide (fig. 74, etc.).

This group of five species occurs from southern California and Arizona to Brazil. It differs from the previous groups by the presence of discs on the male protibiae, and from the following group by lacking the larger bristles on the metasternum of the male.

Chaetarthria spangleri, new species
(Figures 73, 74, 75, 85)

DIAGNOSIS: The yellowish dorsum with no darkening of the pronotal disc and the fairly large size (elytral length generally over 1.45 mm.) distinguish this species through most of its range, that is from extreme southern Mexico through Honduras. In Costa Rica, however, the species apparently is brown dorsally (see variation), and that coloration plus the size should separate it from all other species in that area.

C. bicolor Sharp extends into the range of *spangleri* but is both darker and smaller, the EL generally being under 1.45 mm. in that area. Other yellowish species, *flava*, *veracruzensis*, and *pallida* are known from Mexico north of the known range of *spangleri*, so positive identifications should not be made without examination of male protibiae and aedeagus. The male protibia of *spangleri* has four or five discs, that of *flava* four discs, that of *veracruzensis* three discs, and that of *pallida* three plates.

This species is named for Dr. Paul Spangler, of the National Museum of Natural History, Washington. Dr. Spangler has collected many extensive series of *Chaetarthria*, particularly in Central America, adding greatly to the available material.

DISTRIBUTION: Southern Mexico (Guerrero) south to Costa Rica.

HOLOTYPE: Male, 5 mi. E. of Choluteca, Choluteca, Honduras, July 28, 1965, Paul J. Spangler (USNM). Shape oval, parallel sided at middle, somewhat convex. Head black, punctures shallow and rather sparse, no micropunctation between major punctures, labrum with many fine punctures, vestiture very sparse and fine. Pronotum, scutellum and elytra slightly brownish yellow, scutellum and elytral humeri slightly darker, pronotal punctation and vestiture very sparse and fine, no micropunctation, elytral vestiture slightly thicker and more evident, punctures coarser and more numerous, apex of each elytron with six very shallow, short, longitudinal grooves, the ones nearer the suture being longer, sutural striae traceable for nearly three quarters of way from apex to base. Ventral surface black except antennae, palpi, prosternum and legs yellowish. Protibiae in anterior view widening from base for about half of length, then inner margin bent so margins slightly convergent to apex, about three times as long as greatest width, posterior face of apical portion with series of stalked discs set in groove just behind medial edge, five discs on each protibia. Aedeagus in dorsal view with each paramere elongate, narrow, with large apical spine; penis not visible; basal piece short, bulbous, broader than paramere bases; in lateral view basal piece short and thick with ventrally projecting shelf at anterior margin, slightly less than one and one half times length of parameres; parameres elongate, curved dorsally at tip, composed of an evenly curved ventral plate and flatter dorsal plate which has lateral spine near its tip. EL 1.59 mm., GW 1.23 mm., GH .72 mm., GW/EL .77, GH/EL .45, PL .28 mm.

FEMALE [based on specimen with same data as holotype (USNM), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

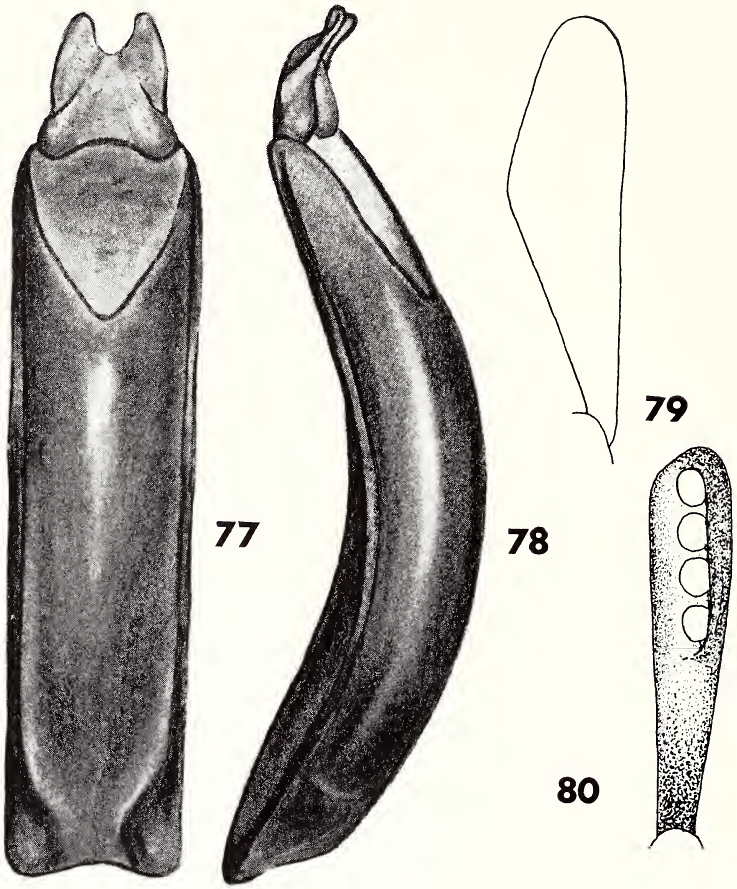
VARIATION: Presence of dark marking on the scutellum and elytral humeri and light grooving of the elytral apex are both somewhat variable characters. A series of one male and two females from Las Cañas, Guanacaste, Costa Rica, has the pronotum, scutellum and elytra brown.

PARATYPES AND FEMALES (total 18 males, paratypes, 28 females, not paratypes): COSTA RICA: *Guanacaste*: Las Cañas, 1 ♂, 2 ♀♀, July 13, 1965, Paul Spangler (USNM). GUATEMALA: *Izabel*: Los Amates, 1 ♂, 4 ♀♀, no date, Kellerman (MCZ). HONDURAS: *Choluteca*: 5 mi. E. of Choluteca, 3 ♂♂, 10 ♀♀, July 28, 1965, Paul J. Spangler (DM, USNM). Pespire, 1 ♂, July 29, 1965, Paul J. Spangler (USNM), 5 ♂♂, 3 ♀♀, August 1, 1967, O. S. Flint (DM, USNM). MEXICO: *Chiapas*: 7.2 mi. SE. of Chiapa de Corzo, 1 ♂, July 8, 1971, Clark, Murray, Hart, Schaffner (TAM). Near Pijijiapan, 1 ♂, 1 ♀, July 5, 1965, Paul J. Spangler (USNM). 2 mi. SW. of Las Cruces, 1 ♂, August 3, 1954, A. A. Alcorn (KU). *Guerrero*: Pie de la Cuesta, 1 ♂, 1 ♀, July 9, 1955, R. B. Selander (CA). *Oaxaca*: Tehuantepec, 1 ♂, 3 ♀♀, July 23, 1964, Paul J. Spangler (USNM). 9 mi. W. of Tehuantepec, 2 ♂♂, 2 ♀♀, June 25, 1965, Burke, Meyer, Schaffner (TAM). *Puebla*: Amatitlan, December (♀ only). The female not accompanied by a male is only tentatively identified.

Chaetarthria magna, new species

(Figures 77, 78, 79, 80, 86)

DIAGNOSIS: The reddish brown to nearly black dorsal color and large size (elytral length usually over 1.8 mm.) will separate this species from all others in southern California and Arizona to northern



FIGS. 77–80. Fig. 77. *Chaetarthria magna*, aedeagus, dorsal. Fig. 78. same, lateral. Fig. 79. left protibia, anterior face. Fig. 80. same, medial face.

Mexico, except for large specimens of *hespera*. This latter species has plates on the male protibiae whereas *magna* has discs. *C. major*, from southern Mexico and Central America, is also large and dark but it has only two discs on the male protibia whereas *magna* has four, and *major* has the male protibiae bent on the inner margin much closer to the apex.

DISTRIBUTION: Southern California and Arizona to northern Mexico.

HOLOTYPE: Male, Camp Pendleton, Oceanside, San Diego County, California, October 25, 1945, H. P. Chandler (CA). Shape broadly oval, moderately convex. Head black, glabrous, punctation extremely fine and sparse, no micropunctation, labrum with many fine punctures. Pronotum, scutellum and elytra dark reddish brown except narrowly paler at sides of pronotum and tip of elytra, pale area extending narrowly anteriorly along sides of elytra, pronotum with only a few fine punctures and a few fine hairs, lacking micropunctation, elytra with vaguely regular rows of punctures, vestiture fine but fairly thick, apex lacking grooves or raised areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs and sides of abdomen yellowish brown, metacoxae and triangular area of metasternum anterior to each coxa reddish brown. Protibiae in anterior view widening sharply for slightly over half of distance from base, then inner margin bent so sides slightly convergent to apex, about three and one third times as long as greatest width, medial face of apical portion with series of stalked discs set in longitudinal depression just behind anterior edge, four discs on each protibia. Aedeagus in dorsal view with each paramere a small irregular rectangle with large curved tooth at the tip; penis elongate, slender, pointed at tip, visible below and between paramere tips; basal piece long, parallel sided; in lateral view basal piece concave ventrally, with narrow longitudinal flange at each side along ventral margin, nearly five times length of parameres; parameres slender, joined to basal piece at nearly right angle; penis extending below parameres, slender, turned up at tip. EL 1.89 mm., GW 1.49 mm., GH .82 mm., GW/EL .79, GH/EL .44, PL .18 mm.

FEMALE [based on specimen with same data as holotype except collected on October 12, 1945 (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Dorsal color varies from a rather light reddish brown to nearly black, the specimens from Baja California Sur being especially dark. The apical pale area of the elytra is variable in extent and clarity but often is clearly marked and covers about the apical eighth of the elytra.

PARATYPES AND FEMALES (total 47 ♂♂, paratypes, 38 ♀♀, not paratypes): MEXICO: *Baja California Sur*: 3 mi. NW. of Miraflores, Canyon San Bernardino, Boca de la Sierra, 1 ♂, 4 ♀♀, January 19, 1959, H. B. Leech (CA). 9 mi. up Canyon San Bernardino from Boca de la Sierra (Potrero), ca. 1500′, 8 ♂♂, 7 ♀♀, August 2, 1971,

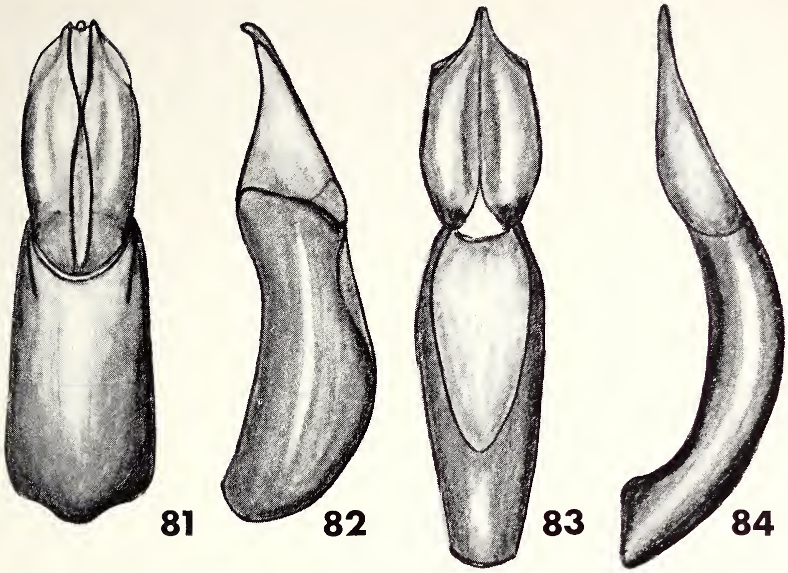
H. G. Real, R. E. Main (CA, DM). *Chihuahua*: 3 mi. W. of Parrita, Santa Clara Canyon, September (♀ only). *Sonora*: Alamos, 2 ♂♂, August 12, 1960, P. H. Arnaud Jr., E. S. Ross, D. C. Rentz (CA). 30 mi. E. of Ures, August (black light) (♀ only). UNITED STATES: *Arizona*: COCHISE CO.: Ramsay Canyon, Huachuca Mountains, March (♀ only). PINAL CO.: Aravaipa Canyon, May (♀ only). Riverside, 2 ♂♂ (AMNH, CA). Superior, July (♀ only). *California*: No further data, 2 ♂♂ (CNHM, MCZ). Southern California, 1 ♂, 1 ♀ (INHS). LOS ANGELES CO.: No further locality, 1 ♂, F. E. Blaisdell (CA), 5 ♂♂, 6 ♀♀, Coquilette (DM, USNM). Los Angeles (♀ only). Pasadena (♀ only). San Fernando, 1 ♂, 1 ♀, April, 1920, F. Winters (RBM). ORANGE CO.: No further locality, 1 ♂, April 11, 1917, J. O. Martin (CA). RIVERSIDE CO.: Riverside, 6 ♂♂, 4 ♀♀, F. E. Winters (CA, DM). San Jacinto Mountains, 1 ♂, F. E. Winters (CA). SAN BERNARDINO CO.: No further data, 2 ♂♂, 1 ♀ (AMNH). San Bernardino, 1 ♂ (MCZ), 3 ♂♂, 1 ♀, August, 1915 (CA), 1 ♂, 1 ♀, August, 1918, Ulke (CA). SAN DIEGO CO.: Oceanside, Camp Pendleton, 6 ♂♂, 2 ♀♀, October 1 to 26, 1945, H. P. Chandler (CA, DM, UCB). SAN JOAQUIN CO.: Mendota, 1 ♂, April 1 (CA). COUNTRY ?: "Wick." (Wickham?), 1 ♂ (MSU). Females not associated with males are only tentatively identified.

Chaetarthria flava, new species
(Figures 81, 82, 85)

DIAGNOSIS: This species is known only from Sonora and Sinaloa, Mexico, and in that area there are only two other dorsally yellowish species, *C. bicolor* (which has been taken with *flava* in both areas where *flava* is certainly known) and *pallida* which has only rarely been collected in Mexico. Both of these species are often marked or shaded with brown on the pronotum, whereas *flava* is more yellowish and never shaded with brown. Also, *flava* averages larger (elytral length usually 1.4 to 1.7 mm. compared with usually 1.3 to 1.5 mm. for the other two species in that area). See also *C. veracruzensis* and *spangleri*, which occur much further south.

DISTRIBUTION: Sonora and Sinaloa, Mexico.

HOLOTYPE: Male, Alamos, Sonora, Mexico, August 12, 1960, P. H. Arnaud Jr., E. S. Ross, D. C. Rentz (CA). Shape oval, somewhat convex. Head black, punctures shallow, coarse, fairly numerous, no micropunctation, labrum with many fine punctures, vestiture very fine and sparse. Pronotum, scutellum and elytra yellow, pronotum with sparse, fine vestiture and sparse, shallow punctures, no micro-



FIGS. 81–84. Fig. 81. *Chaetarthria flava*, aedeagus, dorsal. Fig. 82. same, lateral. Fig. 83. *C. veracruzensis*, aedeagus, dorsal. Fig. 84. same, lateral.

punctation, elytral vestiture and punctation thicker, punctures quite coarse and shallow, apex of each elytron with two very slightly raised longitudinal areas, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface blackish brown except palpi, antennae, prosternum and legs yellow, sides of abdomen paler brown. Protibiae in anterior view widening from base for about two thirds of length, then inner margin bent so sides slightly convergent to apex, about three and one third times as long as greatest width, medial face of apical portion with series of stalked discs set in groove just behind anterior edge, four discs on each protibia. Aedeagus in dorsal view with each paramere an elongate rectangle with its outer margin slightly bowed, tip bluntly rounded and drawn out slightly at medial margin; penis fairly broadly visible between paramere tips, pointed at tip; basal piece elongate, slightly broader than parameres at junction with them and broadening slightly from there anteriorly; in lateral view basal piece fairly thick, slightly concave ventrally, about one and one third times length of parameres; paramere a slightly elongate triangle turned down at tip. EL 1.40 mm., GW 1.16 mm., GH .58 mm., GW/EL .83, GH/EL .41, PL .25 mm.

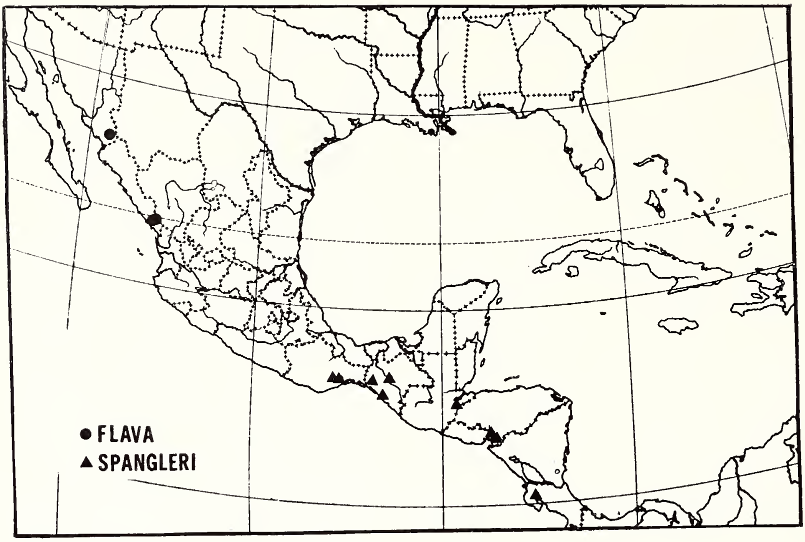


FIG. 85. Distribution of *Chaetarthria flava* and *C. spangleri.*

FEMALE [based on specimen with same data as holotype (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: Only minor variations in color, punctation and vestiture have been noted.

PARATYPES AND FEMALES (total 43 ♂♂, paratypes, 32 ♀♀, not paratypes). MEXICO: *Sinaloa*: Mazatlan, May (brackish pools) (♀ only). 21 to 30 mi. E. of Villa Unión, 16 ♂♂, 13 ♀♀, July 7 and 25, 1964, J. A. Chemsak, J. Powell, H. F. Howden (some at black and white lights) (CNC, DM, UCB). *Sonora*: 27 ♂♂, 14 ♀♀, data as holotype (CA, DM). 10 mi. W. of Alamos, July (♀ only). Females not associated with males are only tentatively identified.

Chaetarthria veracruzensis, new species

(Figures 83, 84, 86)

DIAGNOSIS: The yellowish dorsum and distribution in southern Mexico separate this species from all but *C. spangleri*, *bicolor* and *pallida*. The male protibiae, with three discs, and the aedeagus are diagnostic but females are more difficult to separate. Both *bicolor* and *pallida* average very slightly smaller (elytral length usually 1.5 to 1.6 mm. for *veracruzensis* females and usually under 1.5 mm. for

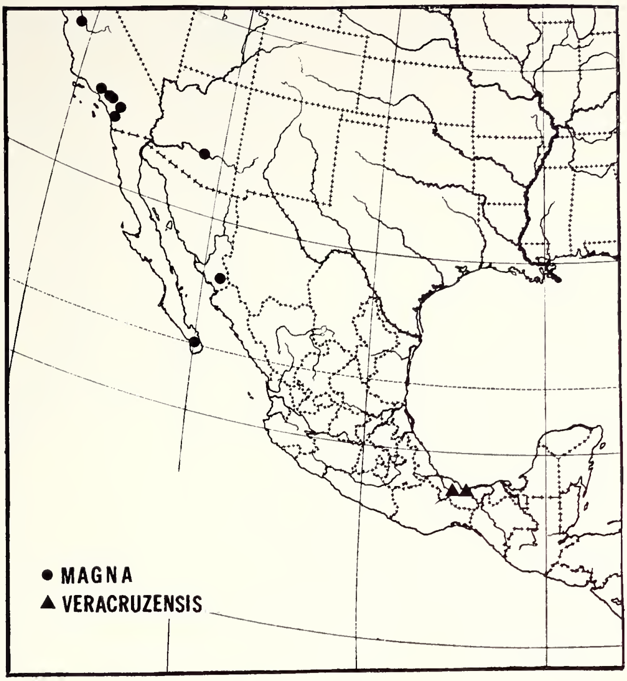


FIG. 86. Distribution of *Chaetarthria magna* and *C. veracruzensis.*

the females of the other two species in Mexico), but they are similar to *veracruzensis* in being brownish yellow. *C. spangleri* is about the same size as *veracruzensis* but averages more yellow, less brownish. See also *C. flava* which occurs well north and west of Veracruz.

DISTRIBUTION: Only Veracruz State, Mexico, near the coast.

HOLOTYPE: Male, 25 mi. S. of Acayucan, Veracruz, Mexico, July 4, 1965, Paul J. Spangler (USNM). Shape oval, somewhat parallel sided at middle, somewhat convex. Head black, coarsely and fairly thickly and evenly punctate except labrum with many fine punctures, no micropunctation between major punctures, vestiture fine and sparse. Pronotum, scutellum and elytra slightly brownish yellow, scutellum and elytral humeri darker, pronotal punctation irregular, fairly coarse and thick, no micropunctation, vestiture fine and sparse, elytral punctation coarser, vaguely regular, vestiture thicker, apex of each elytron with three light, short longitudinal grooves, sutural striae traceable nearly three quarters of way from apex to base. Ventral surface blackish brown except palpi, antennae, prosternum, legs and sides of abdomen paler. Protibiae in anterior view with margins diverging sharply from base for about three fifths of length, then medial margin bent so sides slightly convergent to apex, medial face of apical portion with series of stalked discs set in groove just behind anterior edge, three discs on each protibia. Aedeagus in dorsal view with each paramere a rectangle with outer margin slightly bowed, apex with short tooth laterally and longer one medially, medial tooth pointing somewhat dorsally; penis slender, pointed, visible above tips of parameres; basal piece elongate, roughly parallel sided; in lateral view basal piece concave ventrally, nearly twice length of parameres if straightened out; paramere an elongate triangle; penis curving just dorsal to paramere tips. EL 1.49 mm., GW 1.23 mm., GH .67 mm., GW/EL .82, GH/EL .45, PL .23 mm.

FEMALE [based on specimen with same data as holotype (USNM), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae.

VARIATION: No appreciable variation noted.

PARATYPES AND FEMALES (total 2 ♂♂, paratypes, 1 ♀, not paratype). MEXICO: *Veracruz*: 25 mi. S. of Acayucan, 1 ♂, 1 ♀, data as holotype (DM). 4 mi. E. of Coatzocoalcos, 1 ♂, August 20, 1967, H. R. Burke (black light) (TAM).

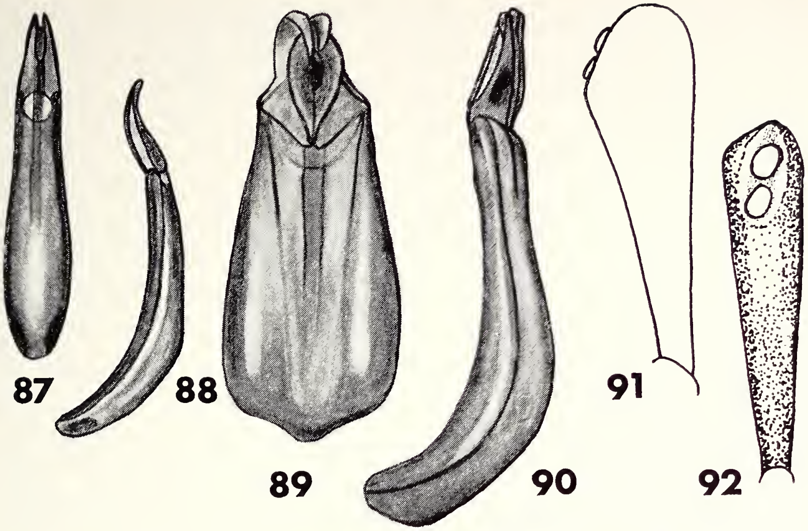
Chaetarthria granulata, new species

(Figures 87, 88, 93)

DIAGNOSIS: The small size (elytral length generally .95 to 1.15 mm.), dark dorsal color with evident, broad, regularly arranged hairs on the elytra, and strong micropunctation of the head and pronotum giving those areas a very dull, granulate appearance, make this species rather distinctive. The elytra are usually brownish, the pronotum black discally and brown at the margins and the head black, the elytral apex is lightly grooved and the elytra often taper somewhat posteriorly from the humeri.

DISTRIBUTION: Only known from the state of Matto Grosso, Brazil.

HOLOTYPE: Male, Jacare, Xingu National Park, Matto Grosso, Brazil, November 1965, Alvarenga and Werner (CNHM). Shape oval, sides straight at middle but slightly convergent from elytral humeri to posterior so beetle widest at humeri, fairly convex. Head black, vestiture fine, labrum with many fine punctures, remainder of head without major punctures but with evident micropunctation giving surface dull, granular look. Pronotum, scutellum and elytra reddish brown except pronotal disc and scutellum blackish, pronotum and scutellum lacking major punctures but strongly micropunctate like



FIGS. 87–92. Fig. 87. *Chaetarthria granulata*, aedeagus, dorsal. Fig. 88. same, lateral. Fig. 89. *C. major*, aedeagus, dorsal. Fig. 90. same, lateral. Fig. 91. same, left protibia, anterior face. Fig. 92. same, medial face.

head, dull and granular looking, vestiture very evident, composed of coarse hairs nearly half as broad as long, irregularly arranged on pronotum but in definite longitudinal rows on elytra, apex of each elytron with three fairly strongly raised longitudinal areas giving apex lightly grooved appearance, sutural striae traceable more than three quarters of way from apex to base. Ventral surface dark reddish brown except palpi, antennae, prosternum, legs and sides of abdomen lighter brown. Protibiae in anterior view widening from base for about three fourths of length, then medial margin curved gradually so sides nearly parallel to apex, about three times as long as greatest width, medial face of apical portion bearing two small stalked discs close together. Aedeagus in dorsal view with parameres together forming an elongate triangle with apex posterior; penis tip broadly visible between paramere tips; basal piece long, nearly parallel sided, widest at middle; in lateral view basal piece somewhat concave ventrally, nearly four times length of parameres; parameres a slender, elongate triangle slightly turned up at tip. EL .98 mm., GW .77 mm., GH .49 mm., GW/EL .79, GH/EL .50, PL .09 mm.

ALLOTYPE: Female with same data as holotype (CNHM). Ex-

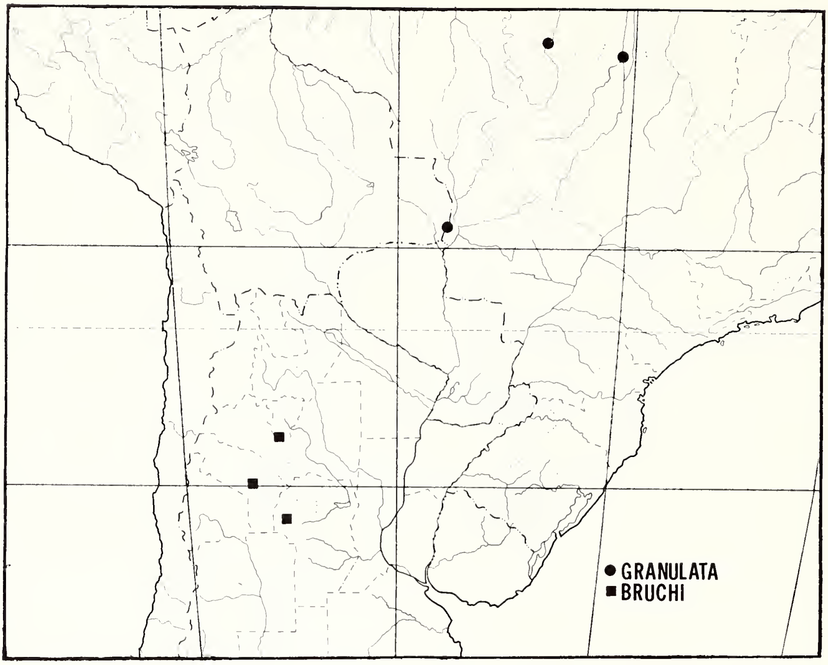


FIG. 93. Distribution of *Chaetarthria bruchi* and *C. granulata*.

ternally like holotype except lacking secondary sexual modifications of protibiae. EL 1.00 mm., GW .79 mm., GH .51 mm., GW/EL .79, GH/EL .49.

VARIATION: The micropunctation of the head and pronotum sometimes extends to the anterior of the elytra making them also appear dull. The abdomen and elytra are most often reddish brown, sometimes black while the labrum and scutellum are most often black but sometimes reddish brown.

PARATYPES (total 41 ♂♂, 36 ♀♀, 50 not sexed): BRAZIL: *Matto Grosso*: Corumba, 19 ♂♂, 9 ♀♀, 50 not sexed (DM, RBM). Jacare, Xingu National Park, 23 ♂♂, 24 ♀♀, November 1965, Alvarenga and Werner (CNHM, IU, UMMZ, USNM). Santa Isabel, Matto Grosso side of Rio Araguaia, 3 ♀♀, August 12 to 22, 1957, Borys Malkin (CA, DM).

THE BICOLOR GROUP

DIAGNOSIS: Head black, remainder of dorsum yellow to black; protibiae of male elbowed or sinuate on inner margin (figs. 91, 100), inner face of apical portion with one or two stalked discs (figs. 92, 99); male metasternum with two longitudinal rows of larger bristles in posterior quarter (difficult to see without good lighting and high magnification); parameres together longer than wide (figs. 89, 95, etc.).

This group of five species occurs from central California south to Costa Rica and east to Utah. Within the group, *C. bicolor* and *ochra* appear closely related as shown by their wing shaped parameres, and *punctulata* and *utahensis* appear closely related because of the asymmetry of their parameres.

Chaetarthria major, new species

(Figures 89, 90, 91, 92, 94)

Diagnosis: This is the only large (elytral length generally over 1.6 mm.), dark colored species known from southern Mexico and Central America, but its range nearly overlaps that of *C. magna*, which it greatly resembles, in central Mexico. Determinations of material from that area should be made only after examination of the male protibiae (with two stalked discs in *major*, four in *magna*) or aedeagus. See also the variation in *C. spangleri.*

Distribution: Central Mexico (Sinaloa) to Honduras.

Holotype: Male, from 21 miles East of Villa Unión, Sinaloa, Mexico, July 25, 1964, 300′, black and white light, J. A. Chemsak and J. Powell (UCB, deposited in CA). Shape broadly oval, parallel sided at middle, fairly convex. Head black, punctation fairly coarse and thick except labrum with many fine punctures, no micropunctation between major punctures, no apparent vestiture. Pronotum, scutellum and elytra shining dark reddish brown, indefinitely paler at elytral apex and sides of pronotum, pronotal punctation sparse, mostly fine, no micropunctation between major punctures, vestiture a few scattered hairs, elytral punctation coarser and thicker, not very regular, vestiture not very evident, of fine hairs in fairly regular longitudinal rows, apex without grooves or raised areas, sutural striae traceable over three-quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum, legs and apical half of abdomen brownish yellow, metasternum with row of yellowish bristles, larger than surrounding vestiture, in posterior quarter on each side of flat medial area. Protibiae in anterior view widening from base for about four-fifths of length, then medial margin gradually curved so sides converging towards apex, about three times as long as greatest width, medial face of apical portion with two stalked discs on each protibia. Aedeagus in dorsal view with each paramere a

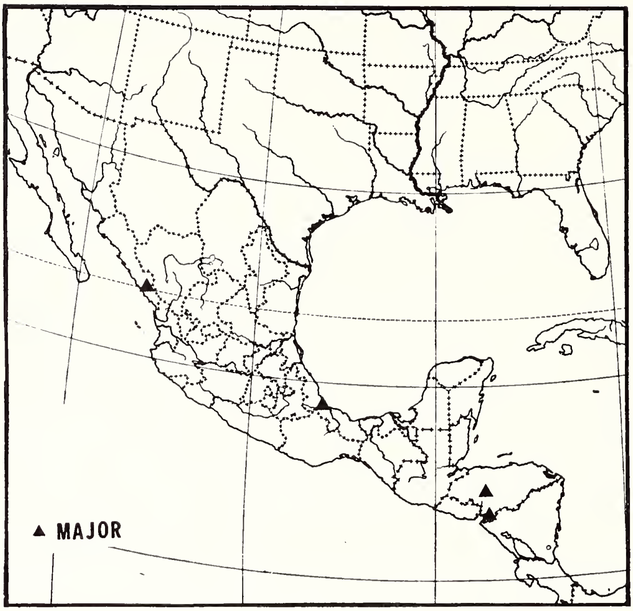


FIG. 94. Distribution of *Chaetarthria major*.

small, finger-like lobe, twisted so margin which is medial at base curves dorsolaterally to lie along outside edge of paramere at tip; penis not visible; basal piece elongate, widest about two-thirds of way from junction with parameres; in lateral view basal piece thin, strongly concave ventrally, over four times length of parameres if straightened out; paramere roughly an elongate triangle. EL 1.80 mm., GW 1.40 mm., GH .80 mm., GW/EL .78, GH/EL .45, PL .12 mm.

FEMALE [based on specimen with same data as holotype (CA), no allotype designated]: Externally like male except lacking secondary sexual modifications of protibiae and metasternum.

VARIATION: Dorsal color runs from dark reddish brown to almost black.

PARATYPES AND FEMALES (total 5 ♂♂, paratypes, 9 ♀♀, not paratypes): HONDURAS: *Choluteca*: 5 mi. E. of Choluteca, 1 ♂, July 28, 1965, Paul J. Spangler (USNM). *Comayagua*: Río Humuya, 1 ♂, August 3, 1967 (USNM). MEXICO: *Chiapas*: Near Pijijiapan, 1 ♀, July. *Oaxaca*: Tehuantepec, 1 ♀, July. *Sinaloa*: Data as holotype, 1 ♂, 7 ♀♀ (♂ DM). Data as holotype but H. F. Howden, 2 ♂♂, 3 ♀♀ (CNC). *Veracruz*: Puente Nacional, 2 ♂♂, July 31, 1966, Flint and Ortiz (DM, USNM). Females not associated with males are only tentatively identified.

Chaetarthria bicolor Sharp

(Figures 95, 96, 97, 98, 99, 100, 101, 106)

Chaetarthria bicolor Sharp, 1882, p. 87. Type locality: near Guatemala City, Guatemala. Type male in British Museum (Natural History). Not examined by me for this study. d'Orchymont, 1939, pp. 3, 4–5. Balfour-Browne, 1939, p. 299. Leech, 1948, pp. 445–446 (cited as "species near *bicolor*").

Chaetarthria bicolor mexicana Balfour-Browne, 1939, pp. 299–300. No type material originally designated; lectotype, from Sierra de Durango, Mexico (RBM), and paralectotype, from Veracruz, Mexico (RBM), designated herein and examined by me for this study. **NEW SYNONYMY.**

DIAGNOSIS: The extensive range and great geographic variability of this species make it impossible to give diagnostic characters which will work in all parts of the range; the only completely consistent character appears to be the male protibia with its slightly sinuate inner margin and single stalked disc near the tip. The wing-like parameres are very similar to those of *C. ochra* but always larger than those of that species (note also that the parameres of *bicolor* are geographically variable).

The northern populations of *bicolor*, around the San Francisco Bay area, are easily recognized by the dark brown to black dorsum with a narrow, clearly defined pale border on the pronotum and elytra and strong longitudinal grooves on the elytral apex (but see also *C. nigrella*). South of this area, as the beetle becomes brownish and finally yellowish from southern California south and east, females are difficult to separate from related species. In these areas *bicolor* averages smaller (elytral length generally under 1.6 mm.) than any other yellowish species except *C. pallida*. *C. bicolor* is generally somewhat brownish yellow, often with brown markings, whereas *C. ochra* averages larger (elytral length generally over 1.6 mm.) and paler yellow and is never marked with brown except on the scutellum and humeri. *C. pallida* often has the pronotum nearly all dark brown to blackish when the elytra are yellowish, while *bicolor* usually has the pronotum and elytra similar in color. Occasional specimens of *bicolor*, however, have the pronotum dark brown with the elytra considerably lighter yellowish brown.

C. spangleri, *veracruzensis*, and *flava* are rarer species sympatric with the southern group of *bicolor* but all average larger (elytral length generally over 1.35 mm.) and more yellowish.

DISTRIBUTION: California west of the Sierra Nevada Mountains from Mendocino County south to Costa Rica, and extending east from southern California to central Texas (McCulloch County).

MALE [based on specimen from Lake Ilopango, La Libertad, El Salvador, August 2, 1965, Paul J. Spangler (USNM)]: Shape oval, somewhat parallel sided at middle, moderately convex. Head black, punctation coarse, irregular, fairly thick, no micropunctation between major punctures, labrum with many fine punctures, vestiture very sparse and fine. Pronotum, scutellum and elytra brownish yellow, pronotal punctation coarse, sparse, shallow, no micropunctation between major punctures, vestiture a few scattered fine hairs, elytral punctation and vestiture thicker, vaguely serial at sides and apex, apex with five short, shallow, longitudinal grooves on each elytron in addition to sutural stria; sutural striae traceable nearly three quarters of way from apex to base. Ventral surface black except palpi, antennae, prosternum and legs brownish yellow, metasternum with row of yellowish bristles, larger than surrounding vestiture, in posterior quarter on either side of flat medial area. Protibiae in anterior view with outer margin straight, medial margin very slightly sinuate with slight bulge near apex, about three and two-thirds times as long as greatest width, medial face with single small stalked disc near apex, behind apical bulge. Aedeagus in dorsal view with parameres each a right triangle about twice as long as greatest width, inner apical corner acute, slightly attenuate, outer apical corner rounded; penis visible between parameres as long triangle; basal piece elongate, parallel sided except joined to parameres by narrow neck; in lateral view basal piece slender, slightly concave ventrally, nearly two and a third times length of parameres; parameres very thin and straight.

FEMALE [based on specimen with same data as male above (USNM)]: Externally like male except sides of abdomen paler and lacking secondary sexual modifications of metasternum and protibiae.

VARIATION: There is variation within populations for the amount of brown in the basic color of the pronotum and elytra, in the presence of brown markings on the pronotal disc and elytral humeri, and in the presence of paler sides on the abdominal sternites. The penis is apparently capable of extension or retraction so that its length relative to that of the parameres appears quite variable.

This species as considered here includes three distinct groups of populations. They would appear to match the concept of subspecies but I have not used formal trinomials to designate them. The northern and central groups appear to interbreed in a broad area south of San Francisco, California, as specimens from that area are variable and intermediate between the northern and central groups in color, elytral grooving and aedeagal characters; see further discussion under the central group.

The aedeagus of *C. ochra* could be considered to fit within the variation of *bicolor* but it is treated as a separate species because its geographic distribution overlaps that of *bicolor* and it differs slightly from that species in male protibiae, size and color (see diagnosis).

Southern group: Extends from Costa Rica to northern Mexico and northeast to central Texas (McCulloch Co.). Both the locality (near Guatemala City) and Balfour-Browne's drawing of the aedeagus (1939, p. 299) of the holotype of *bicolor* place it in this group but I have not seen the specimen. d'Orchymont (1939) illustrated the aedeagus of a specimen from Sierra de Durango (probably the Sierra Madre Occidental within the State of Durango, according to Selander and Vaurie 1962, p. 57) and mentioned another male from Veracruz, Mexico, identifying both specimens as *bicolor.* Balfour-Browne (1939) wrote that d'Orchymont's illustration showed significant difference from Sharp's type of *bicolor* and named the subspecies *bicolor mexicana* based on d'Orchymont's specimens. I have seen both of d'Orchymont's male specimens and they fit within the southern group as here defined. Thus I designate the Sierra de Durango male as lectotype and the Veracruz male as paralectotype for *bicolor mexicana* and reduce that subspecies to a synonym of *bicolor.* I have also examined the male from near Miraflores, Baja California Sur, Mexico, cited as "species near *bicolor*" by Leech (1948, pp. 445–446) and it belongs to this group.

The southern group is characterized by: pronotum and elytra brown to brownish yellow, pronotal disc and elytral humeri sometimes clouded with darker brown; elytral apex often grooved but never as deeply as in the northern group; parameres nearly truncate at apex, not strongly produced laterally, basal piece with fairly broad neck joining to parameres and in lateral view only slightly humped anterior to parameres.

There is also geographic variation within this group, with the more southern populations (Costa Rica, El Salvador) averaging darker brown dorsally and having the parameres somewhat more elongate with the lateral edges more produced apically (but not so much as in the central group). In darker specimens the elytral pubescence is evident as vaguely regular rows of whitish scales shining against the dark background.

No apparent hybrids have been found between this group and the central one. I have labeled specimens of the southern group "So." in collections.

Central group: Extends from extreme southern California and northern Sonora east to central Arizona and north to a zone of apparent hybridization with the northern group in central California (see map, Figure 106).

Characterized by: pronotum and elytra brownish yellow, pronotal disc and elytral humeri often clouded with brown, elytral apex often weakly grooved but very seldom strongly so; lateral apical corners of parameres strongly produced to form a rounded lobe, so entire apex of aedeagus roughly U-shaped, basal piece constricted to a narrow neck joining parameres and in lateral view with dorsal hump just before this junction and a ventral median longitudinal keel extending to this junction; parameres in lateral view approximately continuing straight line of ventral margin of basal piece.

Hybrids with the southern group are unknown but a broad band of apparent hybridization with the northern group exists in central California. Specimens from that area are variably dark brown dorsally with a variably definite pale margin and usually a lightly grooved elytral apex; often the parameres are somewhat apically produced at their lateral margins. The aedeagus is usually more like that of the northern group. In collections, I have labeled specimens of the central group "Cent." and specimens from apparent hybrid populations "No. × Cent."

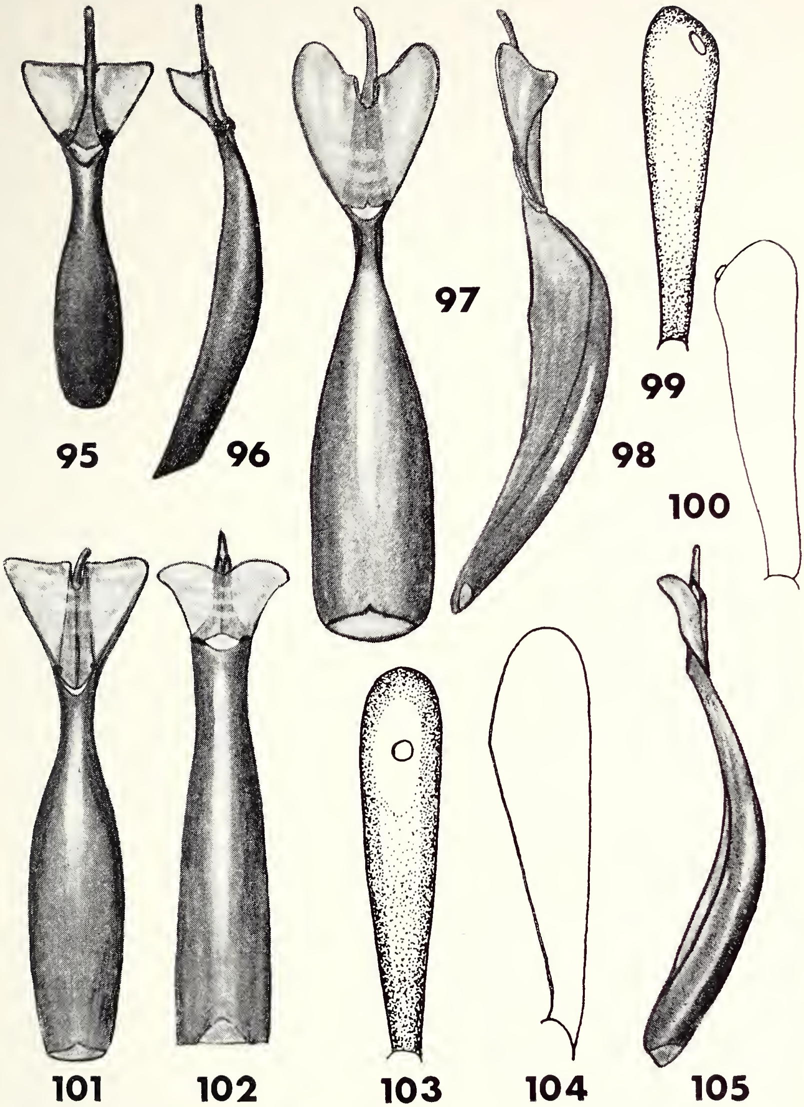
Northern group: Occurs only around the San Francisco Bay area of California.

Characterized by: pronotum and elytra dark brown to black except for sharply defined, narrow pale margin; elytral apex strongly longitudinally grooved; paramere tips not produced apically, apex nearly truncate, basal piece joining parameres by fairly broad neck and in lateral view not strongly humped dorsally on portion basad of parameres, parameres in lateral view approximately continuing curved line of dorsal margin of basal piece.

The broad zone of hybridization of the northern and central groups is discussed under the central group. I have labeled specimens of the northern group "No." in collections.

SPECIMENS EXAMINED: Southern group, 113 males, 105 females 98 not sexed. Central group, 109 males, 123 females. Central × Northern hybrid populations, 19 males, 14 females. Northern group, 19 males, 32 females.

Southern Group: COSTA RICA: *Guanacaste*: Las Cañas, July.



FIGS. 95–105. Fig. 95. *Chaetarthria bicolor*, northern group, aedeagus, dorsal. Fig. 96. same, lateral. Fig. 97. *C. bicolor*, central group, aedeagus, dorsal. Fig. 98. same, lateral. Fig. 99. same, left protibia, anterior face. Fig. 100. same, medial face. Fig. 101. *C. bicolor*, southern group, aedeagus, dorsal. Fig. 102. *C. ochra*, aedeagus, dorsal. Fig. 103. same, left protibia, medial face. Fig. 104. same, anterior face. Fig. 105. same, aedeagus, lateral.

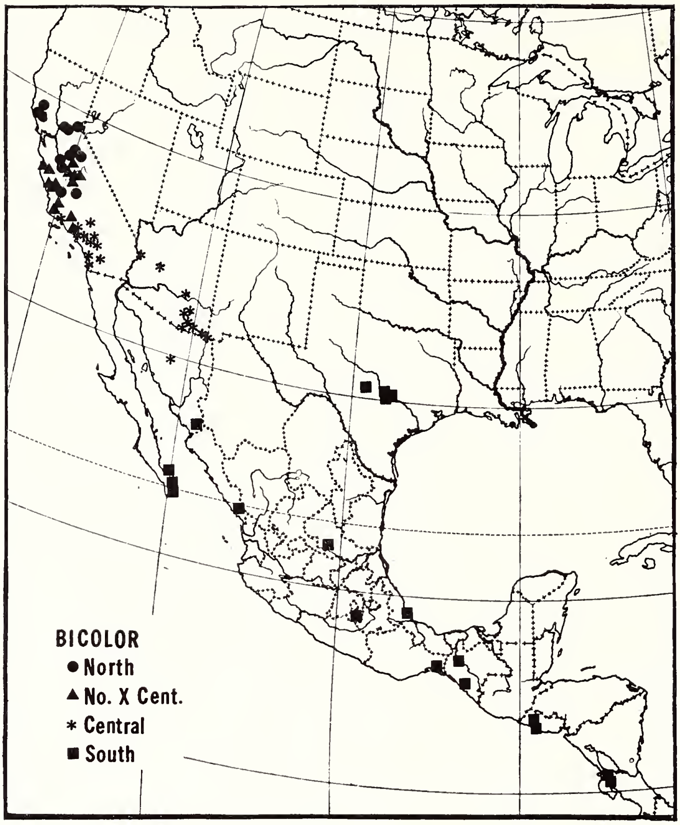


FIG. 106. Distribution of *Chaetarthria bicolor.*

8 mi. SE. Liberia, July. 10 mi. NW. Liberia, July. 12 mi. SW. Liberia, July. EL SALVADOR: *La Libertad*: Lake Ilopango, August. Río Majagual near La Libertad, July. MEXICO: *Baja California Sur*: 2 mi. and 10 mi. NE. of Cabo San Lucas, on highway Sur No. 19, January (light). E. of La Paz, Arroyo Saltito near Las Cruces, January. 12.4 mi. E. of La Paz on road to Las Cruces, Arroyo Agua de Los Posos, January. 3 mi. NW. of Miraflores, Cañon San Bernardino, Boca de la Sierra, January. 5 mi. S. Miraflores, July. *Chiapas*: 2 mi. N. of Ocozocoautla, August (black light). Near Pijijiapan, July. *Durango*: Sierra de Durango (Sierra Madre Occidental). *Mexico*: Tejupilco, Temescaltepec, June. *Oaxaca*: Zanatepec, July. *San Luis Potosi*: 2 mi. S. San Luis Potosi,

November (♀ only). *Sinaloa*: 21 mi. E. of Villa Unión, 300′, July. 27 mi. E. of Villa Unión, July. 28 mi. E. of Villa Unión, August. *Sonora*: Alamos, February, August. *Veracruz*: Veracruz. United States: *Texas*: blanco co.: Cypress Mill, September. brewster co.: Lajitas, May (♀ only). gillespie co.: Lange's Mill, June. llano co.: 2 mi. S. of Buchanan Dam, September. Enchanted Rock, April. mcculloch co.: 16 mi. S. Brady, on San Saba River, June.

Central Group: Mexico: *Sonora*: 30 mi. E. of Ures, August (black light). United States: *Arizona*: cochise co.: Ash Canyon, July. Douglas, September (♀ only). Guadelupe Canyon, 4200′, June, August (♀ only). maricopa co.: Wickenberg, August (light trap). pima co.: Bear Canyon, Santa Catalina Mountains, August. Molino Basin, August (♀ only). Sabino Canyon, June. Tucson, June, August. Palo Verde Campground, Tucson, September (black light). pinal co.: Superior, Boyce Thompson Arboretum, July, August, September (light trap). santa cruz co.: Madera Canyon, Santa Rita Mountains, August (light trap). Nogales, August. yuma co.: Bill Williams Fork, August. county ?: Catalina Springs. *California*: los angeles co.: Azusa, May. Los Angeles, September. Pasadena, February, June. Pico, February (♀ only). Pomona. Rincon, San Gabriel River Station, 1800′, September. Saugus, August. riverside co.: Cleveland National Forest, Dripping Springs Camp, Arroyo Seco Creek, July (♀ only). Palm Springs, April, May. Riverside. Riverside, Lower Sonorian Region. san bernardino co.: Hesperia, June. Victorville, February. san diego co.: El Monte, April (♀ only). Green Valley Falls, April. Mission Dam, September. Mission Valley, March. Oceanside, Camp Pendleton, October. Sweetwater River, March (♀ only). Warner Springs, July. santa barbara co.: Santa Barbara. *New Mexico*: (♀ only). *Texas*: (♀ only).

For the southern and central groups, females taken without males are considered to be only tentatively identified as to species and/or group.

Central Group × Northern Group, Hybrid Populations: United States: *California*: fresno co.: Herndon, August. kern co.: Lebec, May. madera co.: Bates Station, March. monterey co.: Bradley, Salinas River, March. Carmel, February. Pleyto Road at San Antonio River, April. Soledad, August. santa barbara co.: Santa Inez Mountains. san luis obispo co.: 10 mi. W. of Clear Creek, Cuyama Canyon, March (by splashing water on sand). tulare co.: Exeter. Kaweah. Woodlake, June (at light).

Northern Group: United States: *California*: colusa co.:

SW. of Lodoga, Indian Creek 1.5 mi. on road to Cooks Springs, April. EL DORADO CO.: Penryn. FRESNO CO.: Helm, April. Trimmer, August. MADERA CO.: Clover Meadow—North Fork Road, West Fork Chiquito Creek, 4450′, August. Coarsegold, 2000′, June. Raymond, May. MENDOCINO CO.: Dry Creek, Highway 128, September. NAPA CO.: Pope Creek at Walter Springs road, 520′, August. PLACER CO.: Squaw Valley, June. SAN JOAQUIN CO.: Mendota, April. SAN LUIS OBISPO CO.: Santa Margarita. TULARE CO.: 9.5 mi. N. of Kernville, Kern River, March.

Chaetarthria ochra, new species

(Figures 102, 103, 104, 105, 107)

DIAGNOSIS: The generally pale yellow dorsum, usually lacking darker markings except for the black head and often brown elytral humeri and scutellum, will separate most specimens of this species, as other yellowish species generally have at least some clouding or marking with brown or black on the pronotum and/or the elytral disc. The elytral length is generally from 1.6 to 1.8 mm, larger than most yellowish species sympatric with *ochra*, and the overall appearance of *ochra* is usually a little more robust.

The aedeagus of this species is very similar to that of *bicolor* but has the wing shaped parameres smaller and their outer angles more divergent. The male protibiae are also similar to those of *bicolor* but are slightly elbowed on the inner margin near the apex instead of being sinuate (largely due to an apical bulge) as in *bicolor*, and in having the stalked disc proximad of the apex.

DISTRIBUTION: Mendocino County, California, east to Santa Cruz County, Arizona and south to Sonora, Mexico.

HOLOTYPE: Male, Salinas River, Bradley, Monterey County, California, March 8, 1937, H. B. Leech (CA). Shape broadly oval, fairly convex. Head black, coarsely, irregularly and rather sparsely punctate except labrum with many fine punctures, no micropunctation between major punctures, almost no vestiture. Pronotum, scutellum and elytra yellow, lacking dark markings except scutellum slightly darker, pronotum shallowly and fairly sparsely punctate, no micropunctation between major punctures, nearly glabrous, elytra more thickly punctate, in alternate somewhat regular and quite irregular rows, punctures of irregular rows bearing very fine hairs, apex of each elytron with five short, shallowly impressed longitudinal grooves in addition to sutural stria, sutural striae traceable nearly three-quarters of way from apex to base. Ventral surface black except antennae, palpi, prosternum and legs yellow, metasternum with

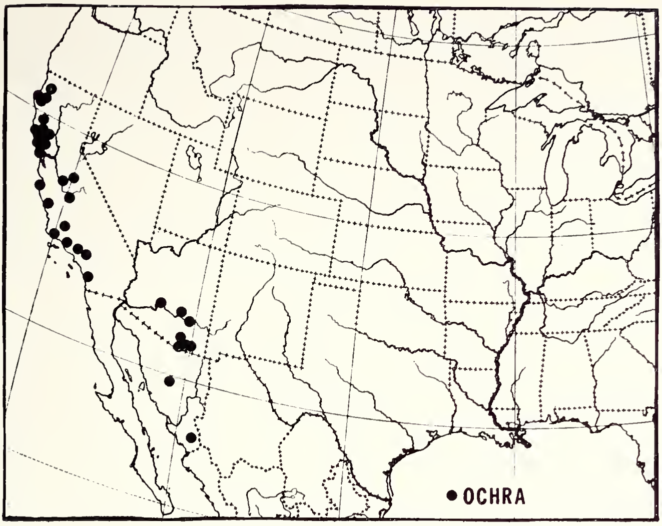


FIG. 107. Distribution of *Chaetarthria ochra.*

row of yellowish bristles, larger than surrounding vestiture, in posterior quarter on either side of flat medial area. Protibiae in anterior view widening from base for about four-fifths of length, then inner margin curved so sides convergent to apex, apex rounded, protibiae about four times as long as greatest width, medial face of apical portion with single stalked disc near elbow. Aedeagus in dorsal view with each paramere a small triangle with one side at aedeagal apex; penis visible extending beyond parameres, filiform, flanked on each side by spine-like extension of inner corner of paramere; basal piece elongate, nearly parallel sided except narrowest in quarter forming juncture with parameres; in lateral view basal piece slightly concave ventrally, if straightened out would be nearly six times length of parameres; parameres thin, flat; penis extending beyond parameres on same plane. EL 1.75 mm., GW 1.35 mm., GH .74 mm., GW/EL .77, GH/EL .42, PL .09 mm.

ALLOTYPE: Female, same data as holotype (CA). Externally like male except lacking secondary sexual modifications of protibiae and metasternum. EL 1.75 mm., GW 1.58 mm., GH .74 mm., GW/EL .81, GH/EL .42.

VARIATION: The penis can be extended or retracted and thus protrudes various lengths beyond the parameres. The dorsum, excluding the black head, has never been seen to have brown clouding or markings except on the elytral humeri and the scutellum, but occasionally the pronotal disc is somewhat transparent and shows underlying structures, thus appearing somewhat clouded. The larger setae on the metasternum of the males are less obvious than in the other species of the group, being often difficult to observe and sometimes apparently absent.

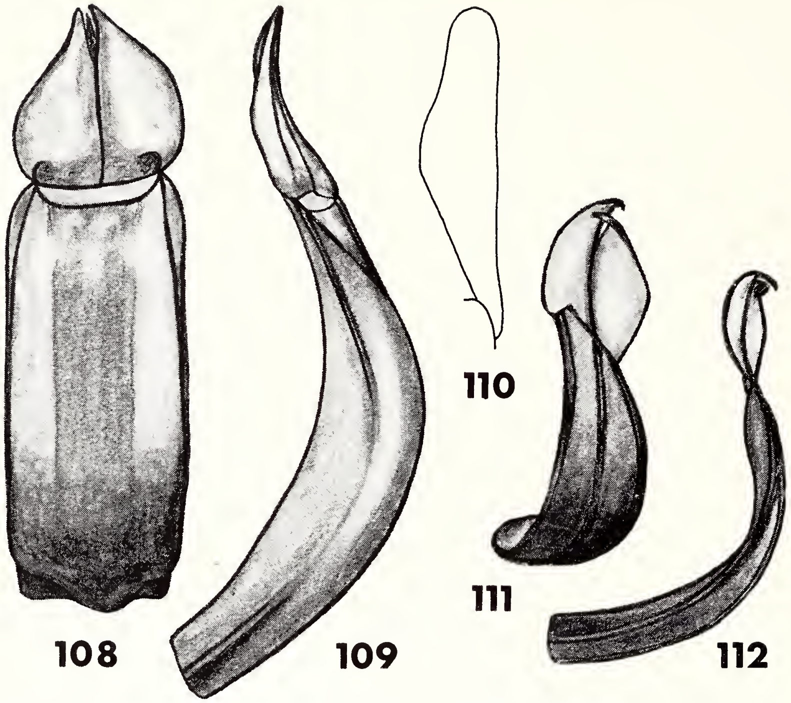
One male, from the Mad River, Trinity County, California (CA) has two stalked discs on the right protibia but only the normal one on the left. This specimen is excluded from the paratypes. The aedeagus is normal for the species.

PARATYPES AND FEMALE: (total 98 ♂♂, paratypes unless otherwise noted, 128 ♀♀, not paratypes): MEXICO: *Sonora*: Alamos, 4 ♂♂, August 12, 1960, P. H. Arnaud Jr., E. S. Ross, D. C. Rentz (CA, DM), February (♀ only). 30 mi. E. of Ures, 19 ♂♂, 23 ♀♀, August 12, 1969, B. S. Cheary (black light) (BM, DM). UNITED STATES: *Arizona*: COCHISE CO.: Sierra Vista, Huachuca Mts., 1 ♂, March, 1965, R. F. Sternitzky (CNC). MARICOPA CO.: Phoenix, 1 ♂, August 3, 1917 (CU), 1 ♂, 1 ♀, July, Wickham (MCZ). PIMA CO.: Tucson, 1 ♂, August 5, 1935, Bryant (CA). PINAL CO.: Riverside, 1 ♂, Wickham (USNM). Superior, 2 ♂♂, 4 ♀♀, July 27, 1948, H. K. Gloyd (light) (INHS). SANTA CRUZ CO.: Harshaw, July (♀ only). Nogales, 5 ♂♂, 7 ♀♀, August 16, 1940 and August 16, 1942, F. W. Nunenmacher (CA, CNHM). Patagonia, 2 ♂♂, 1 ♀, July 10, 1936 (CA), 1 ♂, July 5, 1936 (UCB). Patagonia, Sonita River, 1 ♂, 2 ♀♀, July 18, 1948, C. and P. Vaurie (AMNH). Patagonia Mountains, 1 ♂, July 30, 1957, D. J. and J. N. Knull (OSU). Santa Rita Mountains, July (♀ only). YUMA CO.: Yuma ("Ft. Yuma") (♀ only). *California*: COLUSA CO.: Bear Valley, Bear Creek at Bartlett Springs Road, 2 ♂♂, April 9, 1971, Hugh B. Leech (CA). SW. of Lodoga, Indian Creek 1.5 mi. on road to Cooks Springs, 1 ♂, April 7, 1971, Hugh B. Leech (CA). 6 mi. S. of Stonyford, Little Stony Creek, March (♀ only). FRESNO CO.: Herndon, 2 ♂♂, 1 ♀, August 20, 1918, J. O. Martin (CA). Mendota, 1 ♂, 1 ♀, April 1 (CA). HUMBOLDT CO.: 2.5 mi. N. of road to Hoopa, Toss-up Creek, confluence with Redwood Creek, 650′, 1 ♂, August 13, 1970, Hugh B. Leech (CA). LAKE CO.: 1.7 mi. W. of Kelseyville, Kelsey Creek at Gross Ford, 2 ♂♂, 5 ♀♀, October 11, 1964, H. B. Leech (CA, DM). LOS ANGELES CO.: Rincon, San Gabriel River, Station 1800′, 1 ♂, September 26, 1970, P. D. Perkins (PP). San Fernando, 1 ♂, F. Winters (CA, not paratype, damaged, no genitalia). Whittier, Rio Hondo, September (♀ only). MARIN CO.: Lagunitas, 1 ♂, 1,000′, May 11, 1942, H. P. Chandler (CA).

MENDOCINO CO.: Dry Creek, Highway 128, 1 ♂, 1 ♀, September 5, 1964, Hugh B. Leech (CA). Philo, June (♀ only). 2 mi. S. Yorkville, Rancheria Creek, 2 ♂♂, 3 ♀♀, July 24, 1954, Hugh B. Leech (CA). MONTEREY CO.: Carmel, February, April (♀ only). Monterey, 1 ♂, June 24, 1916, J. O. Martin (CA). NAPA CO.: Pope Creek at Walter Springs Road, 520′, August (♀ only). St. Helena, 1 ♂, July 15 (MCZ). SAN BERNARDINO CO.: Hesperia, June (♀ only). Near Victorville, Mojave River, February (♀ only). SAN DIEGO CO.: Oceanside, Camp Pendleton, 1 ♂, 300′, October 24, 1945, H. P. Chandler (CA). SAN LUIS OBISPO CO.: 10 mi. W. of Clear Creek, Cuyama Canyon, 1 ♂, 2 ♀♀, March 7, 1937, Hugh B. Leech (by splashing water on sand) (CA). Santa Margarita, June (♀ only). SANTA BARBARA CO.: Santa Barbara, 3 ♂♂, 1 ♀ (CA, CU, RBM). Santa Ynez Mts. (♀ only). Santa Ynez (♀ only). SONOMA CO.: Annapolis and Stewarts Point—Healdsburg Road, Wheatfield Branch of Gualala River at bridge, 3 ♂♂, 3 ♀♀, September 7, 1964, Hugh B. Leech (CA, DM). N. road to Annapolis, S. Fork Gualala River, at bridge, 6 ♂♂, 7 ♀♀, October 12, 1964, Hugh B. Leech (CA, DM). 3 mi. S. of Cazadero, Austin Creek, 1 ♂, 1 ♀, April 15, 1950, Hugh B. Leech (CA). Duncan Mills, 2 ♂♂, June 28 and July 9, 1908, F. E. Blaisdell (CA). Guerneville, July (♀ only). TRINITY CO.: bridge near Carrier Gulch, Wildwood Road, Hayfork Creek (♀ only). Hayfork-Wildwood Road, Hayfork Creek, 5 ♂♂, 4 ♀♀, August 11, 1970 and August 7, 1972, Hugh B. Leech (CA, DM). Hayfork Creek just S. of its East Fork, Alt. 823, m., 5 ♂♂, 1 ♀, August 9, 1972, Hugh B. Leech (CA, DM). 0.5 mi. E. of Hyampom, Hayfork Creek, 5 ♂♂, 8 ♀♀, July 23, 1968, Hugh B. Leech (CA, DM). 4.25 mi. SE. Ruth, Mad River just above mouth Van Horn Creek, 1 ♂, 4 ♀♀, July 23, 1968, Hugh B. Leech (CA, ♂ not paratype, two discs on right protibia). TULARE CO.: Exeter, 1 ♂, 1 ♀ (CA). VENTURA CO.: Filmore, 2 ♂♂, 2 ♀♀, March 21, 1923, Warwick Benedict (KU). County ?: No locality, 1 ♂ (MCZ). State ?: "Locality doubtful," 1 ♂ (MCZ). Data unreadable, 1 ♂ (BS).

Chaetarthria utahensis, new species
(Figures 108, 109, 110, 113)

DIAGNOSIS: This medium sized (elytral length 1.5 to 1.7 mm.) species, which is dorsally brown except for the black head, is quite similar to lighter colored specimens of *C. hespera*, with which it is sympatric. Thus males should be examined for the protibiae, with a single stalked disc, and the aedeagus with the slightly asymmetrical



Figs. 108–112. Fig. 108. *Chaetarthria utahensis*, aedeagus, dorsal. Fig. 109. same, lateral. Fig. 110. same, left protibia, anterior face. Fig. 111. *C. punctulata*, aedeagus, dorsal. Fig. 112. same, lateral.

parameres. The closely related *C. punctulata* is smaller (elytral length generally under 1.5 mm.) but has the aedeagus and protibiae similar to those of *utahensis*.

Distribution: Known only from Chad's Ranch, (on Santa Clara Creek, near Veyo, Washington County), Utah.

Holotype: Male, Chad's Ranch, near Veyo, Washington Co., Utah, July 22, Wickham (USNM). Shape oval, fairly convex. Head black, nearly impunctate except labrum with many fine punctures, lacking micropunctation, vestiture a few very fine hairs. Pronotum, scutellum and elytra reddish brown, slightly and vaguely paler at sides of pronotum and elytral apex, pronotum shining, nearly entirely lacking punctation and vestiture, no micropunctation, elytra with large, very shallow punctures arranged in vaguely regular series, vestiture fairly sparse, of very fine hairs, elytral apex lacking grooves or raised areas, sutural striae traceable about three-quarters of way from apex to base. Ventral surface reddish brown except antennae, palpi, prosternum and legs paler and more yellowish, metasternum with row of yellowish bristles, larger than surrounding vestiture, on posterior quarter on either side of flat medial area. Protibiae in anterior view broadening from base for about half of length, then inner margin fairly sharply elbowed so margins convergent to apex, about four times as long as greatest width, medial face of apical portion with single stalked disc set in slight depression near the angle. Aedeagus in dorsal view with parameres together forming triangle with its apex posterior, right paramere slightly larger than left, junction of parameres to basal piece slanting; penis not visible; basal piece elongate, parallel sided, with a narrow flange on each side; in lateral view basal piece somewhat concave ventrally, if straightened out would be somewhat over three times length of parameres; parameres thin, somewhat concave dorsally. EL 1.66 mm., GW 1.31 mm., GH .75 mm., GW/EL .79, GH/EL .45, PL .23 mm.

Female: Unknown.

Variation: The intact paratype is a lighter, less reddish brown than the holotype, and appears to be slightly teneral.

Paratypes: 2 ♂♂, data as holotype (CA, DM). The specimen retained in the author's collection consists only of an aedeagus, the remainder of the beetle having been destroyed.

Chaetarthria punctulata Sharp

(Figures 111, 112, 113)

Chaetarthria punctulata Sharp, 1882, p. 87. Type locality: "Cordova" (Cordoba), Veracruz, Mexico (Salle). Type male in British Museum (Natural History), examined by Mr. Harry Kenward for this study.

Chaetarthria minor: Schwarz, 1914, p. 165 (not Fall). I suspect that this is the species Schwarz had, but am not certain of it.

Diagnosis: Females of this species are difficult to separate from other dark colored, New World *Chaetarthria* which overlap it in range. The elytral length (generally 1.28 to 1.50 mm.) overlaps that of large *pusilla* or of small *nigrella* or *hespera*. Specimens of *nigrella*, however, are very weakly to rather strongly micropunctate between the major punctures on the pronotum, while all the other species mentioned above are smooth between the major punctures. Also *nigrella*, where it is sympatric with *punctulata*, usually has a pale elytral apex. The male protibiae, each with a single stalked disc, will separate *punctulata* from all other dark species in its area. The larger *utahensis* (elytral length 1.5 to 1.7 mm.) is similar and almost

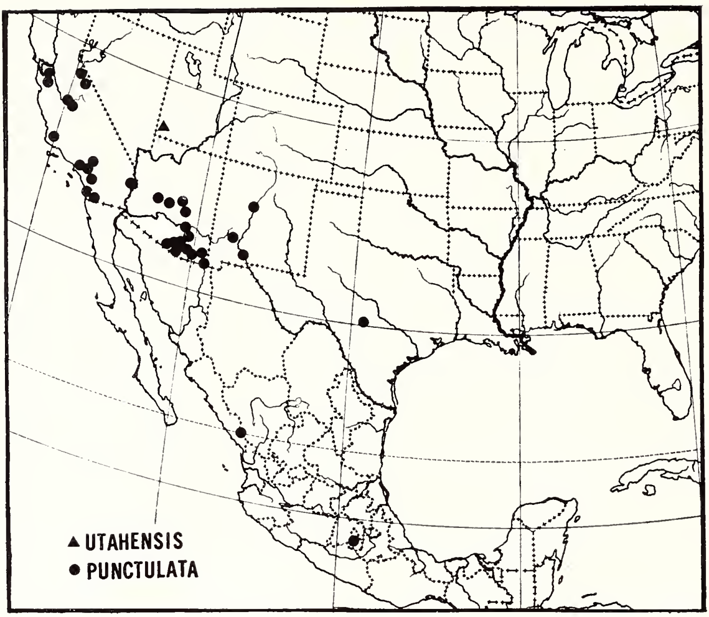


FIG. 113. Distribution of *Chaetarthria utahensis* and *C. punctulata.*

sympatric with *punctulata.* However it has the parameres much less asymmetrical than in *punctulata.*

DISTRIBUTION: Southern California east to Texas and south to the states of Mexico and Veracruz, Mexico.

MALE [based on specimen from Tejupilco, Temescaltepec, Mexico State, Mexico, June 17, 1933, H. E. Hinton and R. L. Usinger (BM)]: Shape oval, somewhat convex. Head black, nearly glabrous, punctation very fine and sparse except labrum with many fine punctures, lacking micropunctures. Pronotum, scutellum and elytra reddish brown, pronotum nearly glabrous and with only a few very fine punctures, no micropunctation between major punctures, elytra thickly and fairly coarsely punctate, punctures in somewhat regular rows and most bearing a fine hair, elytral apex lacking grooves or raised areas, sutural striae traceable about half way from apex to base. Ventral surface dark reddish brown except palpi, antennae, prosternum and legs paler, metasternum with row of yellowish bristles larger than surrounding vestiture, in posterior third on either side of flat medial area. Protibiae in anterior view widening sharply from base for about two-thirds of length, then medial margin elbowed so sides roughly parallel to apex, medial face of apical portion with single stalked disc near elbow. Aedeagus in dorsal view with parameres each roughly a triangle with point at apex of aedeagus, left paramere considerably larger than right, both joining basal piece on slant; penis not visible; basal piece roughly parallel sided, elongate; in lateral view basal piece strongly concave ventrally, if straightened out would be about twice length of parameres; parameres very thin, curving dorsally at tip.

FEMALE [based on specimen with same data as male above (BM)]: Externally like male except head and pronotum somewhat more coarsely punctate, and lacking secondary sexual modifications of protibiae and metasternum.

VARIATION: Dorsal color varies from fairly light reddish brown to nearly black. Punctation varies somewhat and the difference noted between the described male and female above is not consistent in other specimens. The position of the angle on the male protibia varies from about the midpoint, in specimens from the United States, to two thirds of the way to the apex, in Mexican specimens.

SPECIMENS EXAMINED: 117 males, 111 females, about 40 not sexed. MEXICO: *Baja California*: 5.7 mi. E. Hamilton Ranch, Arroyo Santo Domingo, dam site, April (♀ only). La Suerta, Sierra San Pedro Martir, 3700′, June (pool on canyon) (♀ only). *Mexico*: Real de Arriba, Temescaltepec, July. Tejupilco, Temescaltepec, June. *Sinaloa*: 27 mi. E. Villa Unión, July. UNITED STATES: *Arizona*: COCHISE CO.: Guadelupe Canyon, Guadelupe Mountains, June. 5 mi. W. Portal, South West Research Station, 5400′, July, August. Parker Canyon Lake, July. Rucker Creek 8 mi. below Rucker Lake, April (♀ only). St. David, July (small shallow pool) (♀ only). Sunnyside Canyon W. side Huachuca Mountains, 6000′, August (♀ only). GILA CO.: 19 mi. N. Roosevelt, Sycamore Creek, April. MARICOPA CO.: 3 mi. S. Cave Creek, June (light trap). Wickenberg, August (light trap). PIMA CO.: Arivaca, September. Catalina Mountains (♀ only). Gardiner Canyon, Santa Rita Mountains, February. Molino Basin, August (♀ only). Sabino Canyon, Santa Catalina Mountains, December. Tucson, March, April, September. PINAL CO.: 24 mi. W. Casa Grande, September (♀ only). Riverside. Superior, Boyce Thompson Arboretum, July, September (light trap). SANTA CRUZ CO.: 3 mi. W. Fort Huachuca, May. Madera Canyon, Santa Rita Mountains, August (at light). 15 mi. W. Nogales, June (♀ only). 15 mi. NW. Nogales, Peña Blanca Lake, April, May. Ruby, July. Sycamore Canyon, Tumacacori Mountains, Yanks' Spring, August. County ?: Catalina Springs. *California*: FRESNO CO.: Kings River Camp, August. INYO CO.: Deep Springs Valley, Buckhorn Springs, January. Shoshone (♀ only). LOS ANGELES CO.:

Littlerock, Mojave desert (♀ only). Pasadena, June. Saugus, Soledad Canyon, August (♀ only). MONO CO.: Benton Hot Springs, January. RIVERSIDE CO.: E. of Lake Hemet, Garner Valley, San Jacinto Mountains, October (sedges, wet soil). Riverside. SAN BERNARDINO CO.: 7 mi. SW. Parker Dam, February. Near Victorville, Mojave River, February. SAN DIEGO CO.: Mission Dam, September (♀ only). Pine Valley, April (♀ only). Poway. San Mateo Canyon, October (under willow, berlese funnel). The Willows, June. SAN LUIS OBISPO CO.: Nacimiento Reservoir, Bee Rock Campground, July (black light, nearly full moon) (♀ only). SANTA BARBARA CO.: Santa Ynez Mountains (♀ only). 10 mi. E. Santa Maria, Cuyama River, July. SANTA CLARA CO.: Mount Hamilton, August. STANISLAUS CO.: Del Puerto Creek, 4 mi. W. of Route 5, September. TULARE CO.: Kaweah, April. *New Mexico*: BERNALILLO CO.: Albuquerque. DONA ANA CO.: Mesilla Dam, April. SIERRA CO.: 4 mi. E. Hillsboro, Piedra River Gorge, Mimbres Mountains, August. *Texas*: CULBERTSON CO.: 2.5 mi. E. Nickel Creek Station, September (♀ only). KERR CO.: Kerrville, April (light trap). Females taken without males are only tentatively identified.

SPECIMENS OF UNCERTAIN PLACEMENT

Chaetarthria seminulum (Herbst)

A single female labeled Montreal, Quebec, March 27, 1916, J. I. Beauline (CNC) appears to belong to this European species. It probably represents either a specimen mislabeled with respect to locality or an isolated introduction of the species into North America, which has failed to establish a population.

Species A

Three females from Corumba, Matto Grosso, Brazil (RBM) appear to be very similar to *C. glabra* except that they are somewhat less robust (greatest width/elytral length .86 to .90, greatest height/elytral length .53 to .63 as compared with .95 to 1.02 and .67 to .79 for the same ratios in *glabra*). Since no other species of *Chaetarthria* is known to occur in both Central and South America, I doubt that these specimens are *glabra*. They may represent an unnamed species of the *glabra* group. I have deferred naming them until males are found, and have labeled them "Species A."

Species B

Three females from 8 miles Southeast of Liberia, Guanacaste, Costa Rica (USNM) are similar to *C. pusilla* in size but slightly

TABLES OF MEASUREMENTS

TABLE I—MEASUREMENTS OF MALES AND FEMALES

Measurements are in millimeters. For each species the mean, standard deviation, range and number of specimens measured are given in that order.

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
glabra			
males	1.05 ± .02 (1.02–1.09) 10	.99 ± .01 (.98–1.00) 10	.73 ± .03 (.68–.76) 10
females	1.07 ± .05 (.98–1.17) 10	.98 ± .02 (.95–1.02) 10	.70 ± .08 (.67–.79) 10
hintoni			
male	1.09 1	.89 1	.58 1
females	1.14 ± .05 (1.09–1.14) 3	.89 ± .04 (.86– .94) 3	.61 ± .02 (.58–.62) 3
laeticula			
males	1.06 ± .09 (1.00–1.12) 2	.89 (both) 2	.57 ± .01 (.56–.58) 2
females	1.04 ± .14 (.95–1.14) 2	.94 ± .03 (.92– .96) 2	.56 ± .01 (.55–.57) 2
truncata			
males	1.39 ± .06 (1.28–1.45) 10	.81 ± .03 (.78– .86) 10	.53 ± .02 (.51–.55) 10
female	1.51 1	.80 1	.58 1
nigrella			
males	1.47 ± .09 (1.35–1.61) 20	.81 ± .04 (.74– .92) 20	.49 ± .03 (.44–.55) 20
females	1.52 ± .07 (1.38–1.65) 20	.82 ± .04 (.78– .90) 20	.51 ± .02 (.47–.54) 20
atra			
males	1.67 ± .06 (1.54–1.75) 13	.82 ± .04 (.77– .91) 13	.51 ± .05 (.42–.59) 13
females	1.72 ± .09 (1.54–1.86) 12	.83 ± .04 (.77– .91) 12	.52 ± .03 (.47–.59) 12

TABLE I (continued)

Species	Elytral Length	Greatest Width Elytral Length	Greatest Height Elytral Length
atroides			
males	1.87 ± .07 (1.80–1.98) 8	.78 ± .02 (.75– .81) 8	.49 ± .02 (.46–.52) 8
females	1.82 ± .07 (1.70–1.93) 9	.81 ± .02 (.78– .84) 9	.52 ± .02 (.49–.56) 9
hespera			
males	1.71 ± .10 (1.49–1.74) 20	.80 ± .04 (.73– .88) 20	.47 ± .04 (.40–.53) 20
females	1.68 ± .10 (1.52–1.84) 20	.82 ± .03 (.76– .86) 20	.49 ± .03 (.44–.54) 20
spinata			
males	1.90 ± .13 (1.68–2.15) 10	.85 ± .04 (.77– .90) 10	.49 ± .03 (.44–.54) 10
females	1.82 ± .11 (1.61–1.93) 11	.86 ± .05 (.80– .97) 11	.50 ± .03 (.46–.54) 11
leechi			
males	2.05 ± .22 (1.75–2.14) 3	.80 ± .07 (.75– .88) 3	.45 ± .05 (.42–.50) 3
female	2.01 1	.78 1	.45 1
pusilla			
north			
males	1.20 ± .04 (1.12–1.28) 17	.79 ± .03 (.74– .85) 17	.47 ± .02 (.44–.50) 17
females	1.21 ± .05 (1.16–1.31) 11	.79 ± .03 (.74– .86) 11	.50 ± .02 (.46–.54) 11
south			
males	1.03 ± .08 (.93–1.16) 12	.84 ± .05 (.77– .93) 12	.52 ± .04 (.44–.58) 12
females	1.06 ± .06 (.97–1.12) 10	.82 ± .03 (.75– .86) 10	.54 ± .02 (.51–.58) 10
brasilia			
males	1.18 ± .07 (1.05–1.30) 20	.80 ± .04 (.73– .90) 20	.53 ± .02 (.51–.57) 20
females	1.23 ± .06 (1.12–1.35) 20	.79 ± .03 (.73– .84) 20	.54 ± .02 (.50–.59) 20

TABLE I (continued)

Species	Elytral Length		$\frac{\text{Greatest Width}}{\text{Elytral Length}}$		$\frac{\text{Greatest Height}}{\text{Elytral Length}}$	
lateralis						
male	1.66	1	.76	1	.51	1
females	1.72 (both)	2	.77 (both)	2	.51 ± .01 (.50–.52)	2
pallida						
west						
males	1.31 ± .07 (1.14–1.44)	20	.79 ± .03 (.76– .86)	20	.49 ± .02 (.45–.53)	20
females	1.34 ± .10 (1.09–1.52)	20	.80 ± .04 (.75– .91)	20	.50 ± .03 (.44–.56)	20
central						
males	1.35 ± .08 (1.26–1.58)	20	.82 ± .04 (.76– .89)	20	.50 ± .04 (.44–.56)	20
females	1.43 ± .10 (1.26–1.56)	20	.83 ± .03 (.76– .88)	20	.51 ± .03 (.47–.56)	20
Florida						
males	1.28 ± .07 (1.14–1.36)	20	.82 ± .03 (.77– .89)	20	.43 ± .03 (.49–.60)	20
females	1.35 ± .10 (1.10–1.49)	20	.81 ± .03 (.76– .87)	20	.54 ± .02 (.50–.59)	20
pamphila						
males	1.22 ± .08 (1.09–1.33)	18	.82 ± .03 (.77– .89)	18	.51 ± .04 (.47–.58)	18
females	1.25 ± .10 (1.09–1.38)	9	.81 ± .06 (.75– .95)	9	.50 ± .03 (.45–.53)	9
hermani						
males	1.39 ± .19 (1.13–1.49)	5	.81 ± .06 (.76– .88)	5	.50 ± .03 (.47–.54)	5
females	1.44 ± .08 (1.33–1.49)	6	.82 ± .03 (.78– .86)	6	.53 ± .01 (.51–.55)	6
argentina						
males	1.46 ± .05 (1.35–1.56)	20	.81 ± .03 (.77– .88)	20	.47 ± .03 (.43–.53)	20
females	1.54 ± .08 (1.35–1.68)	20	.80 ± .02 (.77– .83)	20	.50 ± .02 (.47–.53)	20

TABLE I (continued)

Species	Elytral Length	$\frac{\text{Greatest Width}}{\text{Elytral Length}}$	$\frac{\text{Greatest Height}}{\text{Elytral Length}}$
pamphiloides			
males	1.26 ± .25 (1.08–1.44) 2	.82 ± .04 (.79– .84) 2	.52 ± .06 (.48–.56) 2
female	1.41 1	.80 1	.51 1
panda			
males	1.57 ± .09 (1.44–1.75) 20	.84 ± .03 (.78– .89) 20	.50 ± .03 (.47–.54) 20
females	1.60 ± .08 (1.47–1.75) 20	.82 ± .04 (.77– .88) 20	.48 ± .02 (.45–.52) 20
malkini			
males	1.31 ± .06 (1.17–1.40) 18	.81 ± .04 (.74– .88) 18	.49 ± .03 (.45–.54) 18
females	1.30 ± .05 (1.21–1.40) 17	.82 ± .03 (.77– .87) 17	.52 ± .03 (.49–.57) 17
goldbachi			
Argentina			
males	1.65 ± .06 (1.54–1.79) 20	.79 ± .02 (.75– .82) 20	.46 ± .02 (.41–.49) 20
females	1.64 ± .06 (1.51–1.75) 20	.80 ± .02 (.76– .85) 20	.48 ± .03 (.43–.52) 20
Brazil			
males	1.36 ± .06 (1.23–1.45) 20	.79 ± .03 (.75– .85) 20	.45 ± .03 (.38–.51) 20
females	1.27 ± .09 (1.12–1.45) 20	.80 ± .03 (.75– .82) 20	.48 ± .03 (.45–.53) 20
bruchi			
males	1.62 ± .07 (1.45–1.73) 20	.81 ± .02 (.76– .85) 20	.48 ± .03 (.44–.53) 20
females	1.69 ± .05 (1.61–1.75) 20	.82 ± .02 (.80– .88) 20	.49 ± .02 (.46–.54) 20
spangleri			
males	1.60 ± .08 (1.45–1.75) 19	.79 ± .03 (.74– .86) 19	.44 ± .02 (.43–.48) 19
females	1.55 ± .11 (1.38–1.77) 22	.79 ± .02 (.76– .84) 22	.46 ± .03 (.41–.52) 22

TABLE I (continued)

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
magna			
males	1.87 ± .08 (1.65–1.96) 20	.81 ± .02 (.77– .85) 20	.45 ± .02 (.42–.48) 20
females	1.93 ± .10 (1.66–2.12) 20	.80 ± .02 (.77– .86) 20	.46 ± .02 (.42–.48) 20
flava			
males	1.43 ± .06 (1.33–1.51) 20	.81 ± .02 (.75– .84) 20	.44 ± .03 (.40–.51) 20
females	1.53 ± .08 (1.44–1.77) 20	.80 ± .02 (.76– .85) 20	.46 ± .03 (.42–.54) 20
veracruzensis			
males	1.45 ± .04 (1.42–1.49) 3	.81 ± .02 (.78– .82) 3	.45 ± .02 (.43–.46) 3
females	1.53 ± .04 (1.51–1.56) 2	.81 ± .03 (.79– .83) 2	.48 ± .02 (.46–.49) 2
granulata			
males	1.04 ± .05 (.96–1.12) 20	.79 ± .02 (.75– .83) 20	.48 ± .02 (.44–.52) 20
females	1.07 ± .05 (.98–1.14) 20	.79 ± .01 (.76– .81) 20	.48 ± .02 (.45–.51) 20
major			
males	1.72 ± .08 (1.56–1.82) 8	.80 ± .01 (.78– .82) 8	.45 ± .02 (.42–.48) 8
females	1.82 ± .08 (1.72–1.98) 13	.80 ± .03 (.75– .85) 13	.46 ± .02 (.42–.49) 13
bicolor			
north			
males	1.40 ± .06 (1.31–1.49) 17	.77 ± .02 (.73– .80) 17	.45 ± .02 (.43–.49) 17
females	1.42 ± .08 (1.24–1.56) 20	.79 ± .02 (.75– .84) 20	.47 ± .02 (.45–.50) 20
no. × cent.			
males	1.44 ± .06 (1.33–1.54) 13	.79 ± .02 (.76– .83) 13	.46 ± .04 (.42–.57) 13
females	1.48 ± .08 (1.33–1.63) 13	.79 ± .02 (.75– .82) 13	.46 ± .02 (.42–.49) 13

Table I (continued)

Species	Elytral Length	Greatest Width / Elytral Length	Greatest Height / Elytral Length
central			
males	1.51 ± .07 (1.44–1.61) 20	.77 ± .03 (.73– .80) 20	.44 ± .01 (.42–.47) 20
females	1.48 ± .09 (1.24–1.63) 20	.79 ± .02 (.76– .84) 20	.47 ± .03 (.41–.53) 20
south			
males	1.34 ± .05 (1.26–1.45) 20	.79 ± .02 (.75– .82) 20	.46 ± .02 (.42–.51) 20
females	1.40 ± .07 (1.22–1.49) 20	.79 ± .02 (.75– .83) 20	.47 ± .02 (.43–.51) 20
ochra			
males	1.71 ± .07 (1.59–1.82) 20	.81 ± .04 (.74– .97) 20	.44 ± .02 (.39–.48) 20
females	1.76 ± .07 (1.66–1.91) 20	.79 ± .02 (.76– .84) 20	.44 ± .02 (.41–.47) 20
utahensis			
males	1.59 ± .10 (1.52–1.66) 2	.80 ± .01 (.79– .81) 2	.49 ± .05 (.42–.52) 2
punctulata			
males	1.37 ± .07 (1.26–1.49) 20	.80 ± .02 (.75– .85) 20	.46 ± .03 (.42–.52) 20
females	1.43 ± .06 (1.33–1.54) 20	.80 ± .02 (.76– .84) 20	.48 ± .04 (.45–.60) 20
Species A			
females	1.19 ± .07 (1.14–1.29) 3	.88 ± .02 (.86– .90) 3	.58 ± .05 (.53–.63) 3
Species B			
females	1.11 ± .03 (1.09–1.14) 3	.79 (all) 3	.47 ± .01 (.46–.48) 3

TABLE II—MEASUREMENTS OF MALES ONLY

Paramere measurements are in millimeters, protibial are counts of plates or discs. For each species the mean, range and number of specimens measured are given in that order.

Species	Paramere length	Protibial Plates or Discs
glabra	.19 ± .01 (.18–.21) 10	None
hintoni	.18 1	None
laeticula	.23 ± .02 (.21–.25) 2	None
truncata	.26 ± .02 (.25–.32) 10	None
nigrella	.18 ± .01 (.17–.19) 20	1 large spine
atra	.27 ± .01 (.26–.28) 13	9.8 ± .6 (9–11) 13
atroides	.42 ± .01 (.40–.44) 7	7.3 ± .5 (7– 8) 8
hespera	.16 ± .01 (.16–.19) 20	5.2 ± .6 (4– 7) 20
spinata	.23 ± .01 (.23–.26) 10	11.0 ± 1.1 (10–13) 10
leechi	.40 ± .02 (.39–.42) 3	9.0 ± 1.0 (8–10) 3
pusilla		
north	.09 (all) 17	5.7 ± .5 (5– 6) 17
south	.08 ± .01 (.07–.09) 11	5.3 ± .5 (5– 6) 10
brasilia	.22 ± .01 (.21–.25) 20	2.1 ± .2 (2– 3) 20
lateralis	.35 1	10 1
pallida		
west	.23 ± .01 (.21–.24) 20	3 (all) 20
central	.18 ± .01 (.16–.19) 20	3 (all) 20
Florida	.17 ± .01 (.16–.18) 20	3 (all) 20
pamphila	.16 ± .01 (.16–.18) 18	4.9 ± .3 (4– 5) 18
hermani	.23 (all) 5	4 (all) 5
argentina	.21 ± .01 (.19–.23) 20	5.0 ± .1 (4– 6) 20
pamphiloides	.23 1	6.5 ± .7 (6– 7) 2
panda	.34 ± .04 (.26–.39) 20	7.8 ± .5 (7– 9) 20
malkini	.22 ± .01 (.21–.23) 18	7.4 ± .7 (6– 9) 18
goldbachi		
Argentina	.32 ± .01 (.30–.33) 20	9.7 ± .7 (9–11) 20
Brazil	.30 ± .02 (.28–.32) 20	7.7 ± .7 (7– 9) 20
bruchi	.30 ± .01 (.28–.32) 16	6.4 ± .6 (6– 8) 19
spangleri	.33 ± .03 (.28–.37) 19	4.7 ± .5 (4– 5) 19
magna	.17 ± .01 (.16–.18) 20	4 (all) 20

TABLE II (continued)

Species	Paramere length		Protibial Plates or Discs	
flava	.25 ± .01 (.23–.26)	20	4 (all)	20
veracruzensis	.23 (all)	3	3 (all)	3
granulata	.10 ± .01 (.09–.12)	20	2 (all)	20
major	.12 ± .01 (.10–.14)	7	2 (all)	8
bicolor				
north	.13 ± .01 (.10–.16)	17	1 (all)	17
no. × cent.	.14 ± .01 (.12–.14)	13	1 (all)	13
central	.19 ± .01 (.16–.22)	20	1 (all)	20
south	.15 ± .02 (.12–.16)	20	1 (all)	20
ochra	.10 ± .01 (.09–.12)	20	1 (all)	20
utahensis	.22 ± .01 (.21–.23)	3	1 (all)	3
punctulata	.16 ± .01 (.14–.18)	20	1 (all)	20

larger (elytral length 1.08 to 1.14 mm. as compared to .93 to 1.14 mm. for southern group *pusilla*), and in shape and color. However they have the elytral vestiture much more evident, that is as whitish scales in fairly clear longitudinal series. Although they might be aberrant *pusilla* I suspect that they are an unnamed species and have labeled them "Species B" pending the discovery of males.

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Mr. John Balfour-Browne, British Museum (Natural History) (BM)
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REVIEW OF THE GENERA EUPLECTUS, PYCNOPLECTUS, LEPTOPLECTUS, AND ACOLONIA (COLEOPTERA: PSELAPHIDAE) INCLUDING NEARCTIC SPECIES NORTH OF MEXICO

John Alexander Wagner

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REVIEW OF THE GENERA EUPLECTUS, PYCNOPLECTUS, LEPTOPLECTUS, AND ACOLONIA (COLEOPTERA: PSELAPHIDAE) INCLUDING NEARCTIC SPECIES NORTH OF MEXICO

John Alexander Wagner[1]

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Abstract: The genera *Euplectus*, *Pycnoplectus*, *Leptoplectus*, and *Acolonia* are reviewed for Nearctic species North of Mexico. These four genera are closely related pselaphid beetles in the subtribe Euplectina. Ten *Euplectus* species are recognized including two unreported European species in Eastern North America. Eleven *Pycnoplectus* species are recognized, including three new species. *Leptoplectus* and *Acolonia* each have one species. Several new combinations and synonymies are established. Descriptions and keys of genera, species groups, and species are included, with figures of some of the significant features of these taxa. A discussion of ecology, and some notes on behavior and distribution complete the report.

INTRODUCTION

The family Pselaphidae was described by Latreille in 1807. In 1816 H. T. Reichenbach in his *Monographia Pselaphorum* described three European species, *nanus*, *karsteni*, and *signatus* in the genus

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Pselaphus. W. E. Leach erected the genus *Euplectus* in 1817 with *Euplectus nanus* (Reichenbach) becoming the type species for the genus. Due to the early recognition of this genus a great number of species, mostly European, were named during the latter 1800's. Many of these species, although euplectine in form, were not true *Euplectus*, and the task of unscrambling this heterogeneous group was assumed by the brilliant coleopterist, Achille Raffray. In 1910 he revised the Palearctic *Euplectus* in what constituted the first regional treatment of the genus. Raffray emphasized the taxonomic importance of the secondary features of the male venter, but warned against the use of slight differences in establishing subspecies, varieties, and races.

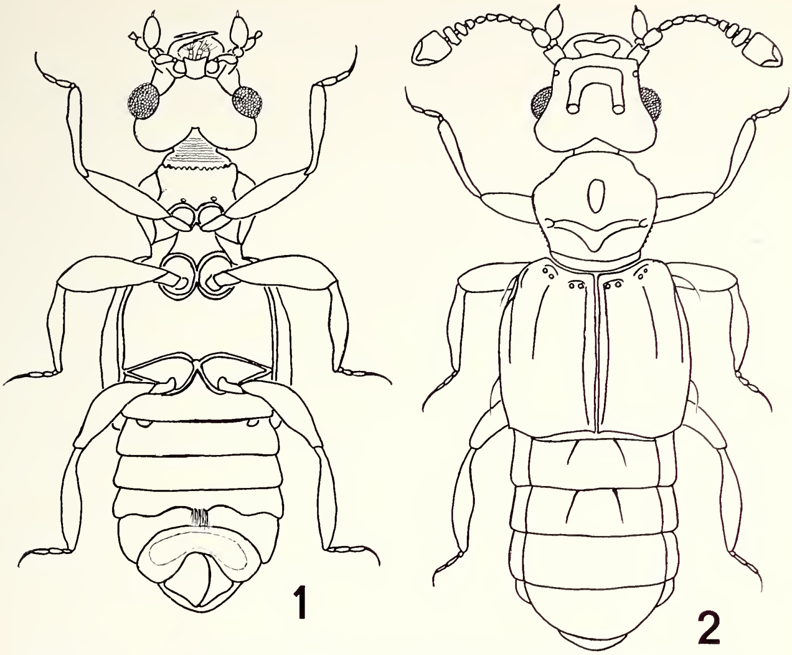
René Jeannel has made the most significant contributions to knowledge of the Afro-Eurasian pselaphid taxonomy since Raffray, and currently Claude Besuchet and Zora Karaman have each contributed to the modern systematics of the *Euplectus* populations of these regions.

The first North American *Euplectus*, described by John L. LeConte in 1850, were from the Eastern United States. In the following years a number of additional species were described by Thomas L. Casey, Emil Brendel, Raffray, and John R. Bowman. In 1893 Casey divided the North American *Euplectus* into three subgeneric groups, two of which, *Pycnoplectus* (Casey, 1897) and *Leptoplectus* (Casey, 1908) he later named and elevated to generic rank. The third group remained as *Euplectus*, *sensu strictiore*, and appears more closely allied with Palearctic *Euplectus* (*s. st.*) and *Euplectus* (*Diplectellus*) Reitter. Also in 1893 Casey established the genus *Acolonia* for a species which LeConte had earlier placed in *Euplectus*. Subsequent authors accepted these divisions except for the genus *Pycnoplectus*. Park (1942, p. 26) considered it to be of subgeneric status, but I now consider *Pycnoplectus* to be of valid generic rank.

Four distinct genera can be defined based on the characteristics presented in the key and on the general appearance. In particular, the loss of anterior prosternal foveae in *Pycnoplectus*, and the dextral arcuation of the seventh sternite are fundamental changes from *Euplectus* and must involve internal muscular rearrangements. The form of the aedeagi, and modifications of the male venter seem to confirm these genera as natural groups.

The eminent American authority, Orlando Park, studied *Euplectus* in the 1950's, and when I became his student he suggested that I work on the genus. I was able to examine all of the type specimens of Nearctic *Euplectus* and its derived genera, and this study is based on those examinations as well as extensive field collections.

It is curious to note that two of the original *Euplectus* species,



FIGS. 1–2. *Euplectus confluens* LeConte. 1. Ventral. 2. Dorsal.

karsteni and *signatus* of Europe, are found in Eastern North America. Our information on the Holarctic relationships of the genus is quite incomplete, but this report establishes the solid generic characters of the Nearctic *Euplectus* and its associated genera, and suggests that zoogeographic studies of this cosmopolitan group might prove to be most rewarding.

CHECKLIST

Euplectus Leach, 1817, p. 80

confluens group

Euplectus confluens LeConte, 1850, p. 105.
Euplectus longicollis Casey, 1884, p. 99.
Euplectus karsteni (Reichenbach), 1816, p. 71.
  Euplectus iowensis Casey, 1893, p. 456. **New synonym.**
Euplectus filiformis (Casey), 1908, p. 268. **New combination.**

californicus group

Euplectus californicus Casey, 1887, p. 476.
Euplectus acomanus Casey, 1908, p. 265.

Euplectus idahoensis Park and Wagner, 1961, p. 17.
Euplectus elongatus Brendel, 1893, p. 281.
Euplectus duryi Casey, 1908, p. 266.
  Euplectus barri Park and Wagner, 1961, p. 17. **New synonym.**
Euplectus (*Diplectellus*) *signatus* (Reichenbach), 1816, p. 73.

Pycnoplectus Casey, 1897, p. 552

linearis group

Pycnoplectus linearis (LeConte), 1850, p. 104. **New combination.** Type species.
  Euplectus impressiceps Casey, 1908, p. 265. **New synonym.**
Pycnoplectus interruptus (LeConte), 1850, p. 105. **New combination.**
  Euplectus hudsonicus Casey, 1893, p. 455. **New synonym.**
Pycnoplectus cediosus, new species.
Pycnoplectus parki, new species.

sexualis group

Pycnoplectus sexualis (Casey), 1884, p. 103. **New combination.**
Pycnoplectus spinifer (Casey), 1884, p. 104. **New combination.**
Pycnoplectus infossus (Raffray), 1903, p. 541. **New combination.**
  Euplectus excavatus Bowman, 1934, p. 141. **New synonym.**

congener group

Pycnoplectus congener (Casey), 1884, p. 101. **New combination.**
  Pycnoplectus tenellus Casey, 1897, p. 552. **New synonym.**
Pycnoplectus longipennis (Casey), 1908, p. 264. **New combination.**
Pycnoplectus difficilis (LeConte), 1850, p. 106. **New combination.**
  Euplectus longissimus Brendel, 1890, p. 71. **New synonym.**
Pycnoplectus falcatus, new species.

Leptoplectus Casey, 1908, p. 266

Leptoplectus pertenuis (Casey), 1884, p. 109.
  Leptoplectus insolens Casey, 1908, p. 268. **New synonym.**
  Leptoplectus exilissimus Casey, 1908, p. 269. **New synonym.**

Acolonia Casey, 1893, p. 443, 454
Acolonia cavicollis (LeConte), 1878, p. 387.

SPECIES OF DOUBTFUL POSITION OR VALIDITY

At present the females of the *Euplectus* Complex are identified to species only by association with male specimens. Further study may disclose characters that will permit a valid female taxonomy as Grigarick and Schuster (1971) have done for *Actium* and *Actiastes*. The following three species were described from single female specimens. I have examined the types, and as is usual for females, I have found no distinguishing characters. Casey's descriptions are of a generic nature, therefore, *Euplectus disjunctus* Casey, 1897, p. 554 (USNM Type no. 38621); *Euplectus floridae* Casey, 1908, p. 264 (USNM Type no. 38620); and *Euplectus imperfectus* Casey, 1897, p. 553 (USNM Type no. 38612) should each be considered a *nomen dubium*.

Euplectus schmitti was described by Raffray from a specimen or specimens sent to him by Jerome Schmitt of St. Vincent College. The locality given by Raffray is Pennsylvania, probably St. Vincent or nearby Chestnut Ridge, both in Westmoreland County. I examined the type of *E. schmitti*, from the Paris Museum and found it to be a female! Raffray's description is of a male with the following diagnostic characters: The sixth ventral segment has a slight impression, and the seventh is transverse and obliquely carinate. This description places *schmitti* near *E. duryi* Casey. Until the male type is located or more specific information is available, *Euplectus schmitti*, Raffray, 1903, p. 540 should be considered a *nomen dubium*.

Two other species, *Euplectus planipennis* Brendel, 1889, p. 195 and *Euplectus rotundicollis* Brendel, 1890, p. 61 are not *Euplectus*. The types are males each with seven sternites, the seventh a simple, undivided plate, as in *Ramecia*, but their true generic status has not been established.

KEY TO THE GENERA OF THE EUPLECTUS COMPLEX OF THE NEARCTIC REGION

1. Head with supraocular and short infraocular sulcus; known only from Florida, very rare .... *Acolonia* Casey
   Head not provided with such sulci 2
2. Form slender and small; head flattened with shallow, glabrous frontal depression (fig. 14); labrum truncate, deeply divided by U-shaped notch (fig. 14); last antennal segment with single, large, anteapical sensory fossa (fig. 11) .... *Leptoplectus* Casey
   Form relatively larger; frontal depression and labrum not as

described; last antennal segment with two large, anteapical sensory fossae (fig. 12) 3

3. Vertexal foveae small and nude; anterior prosternal foveae present (fig. 9, APF)[2]; mandibles with only aciculate setae on external face (fig. 8); males with carina of seventh sternite arcuate to the morphological left; aedeagus without accessory phallus (fig. 16, AP) .... *Euplectus* Leach

Vertexal foveae large and pubescent (only evident in dry specimens); anterior prosternal foveae obsolete[2]; mandibles with spinoid seta on external face (figs. 6 and 7); males with carina of seventh sternite arcuate to morphological right; aedeagus with accessory phallus (fig. 16, AP) .... *Pycnoplectus* Casey

Genus **Euplectus** Leach

Euplectus Leach, 1817, p. 80. Type species, *Euplectus nanus* (Reichenbach), 1816, p. 69 (original genus, *Pselaphus*). Aube, 1833, p. 51 (descript.). Subsequent references to Nearctic species: LeConte, 1850, p. 105 (descript.). Henshaw, 1885, p. 30 (cat. citation). Brendel & Wickham, 1890, p. 53 (key to spp.; descript. note; distr. data). Casey, 1893, p. 454 (key to subgeneric groups). Raffray, 1903–04, p. 84 (cat. citation); 1908, p. 84 (descript.; key to subgenera; cat. world spp.); 1911, p. 29 (cat. world spp.). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 25 (key to spp.; descript.; summary of fauna to date). Park, 1942, p. 99 (descript. notes; distr. data); 1952, p. 89 (key to spp.; distr. data), p. 144 (figs.); 1953c, (key to U.S. genera; checklist). Park & Wagner, 1961, p. 16 (descript.; distr. data; figs.). Arnett, 1961, p. 321 (cat. citation).

DISCUSSION: This genus includes ten species in Canada and the United States which I consider valid. The four Mexican Nearctic species in *Euplectus* are represented by only 22 specimens in the Park collection (OP-FMNH). Park (1952, p. 91) suggested that *parvoculatus* and *patocolus* could well be placed in a new subgenus. I agree and would add *guatemalenus* and *mexicanus* to this group. Considering the small sample sizes of these species it seems best to wait until some of the recent Mexican and Central American collections are studied before redefining these interesting populations.

Euplectus is quickly characterized by 1) small nude vertexal foveae, 2) the absence of cephalic sulci adjacent to the eyes, 3) the presence of anterior prosternal foveae, 4) males with the carina of seventh sternite arcuate to the left, and 5) the aedeagus lacking the accessory phallus.

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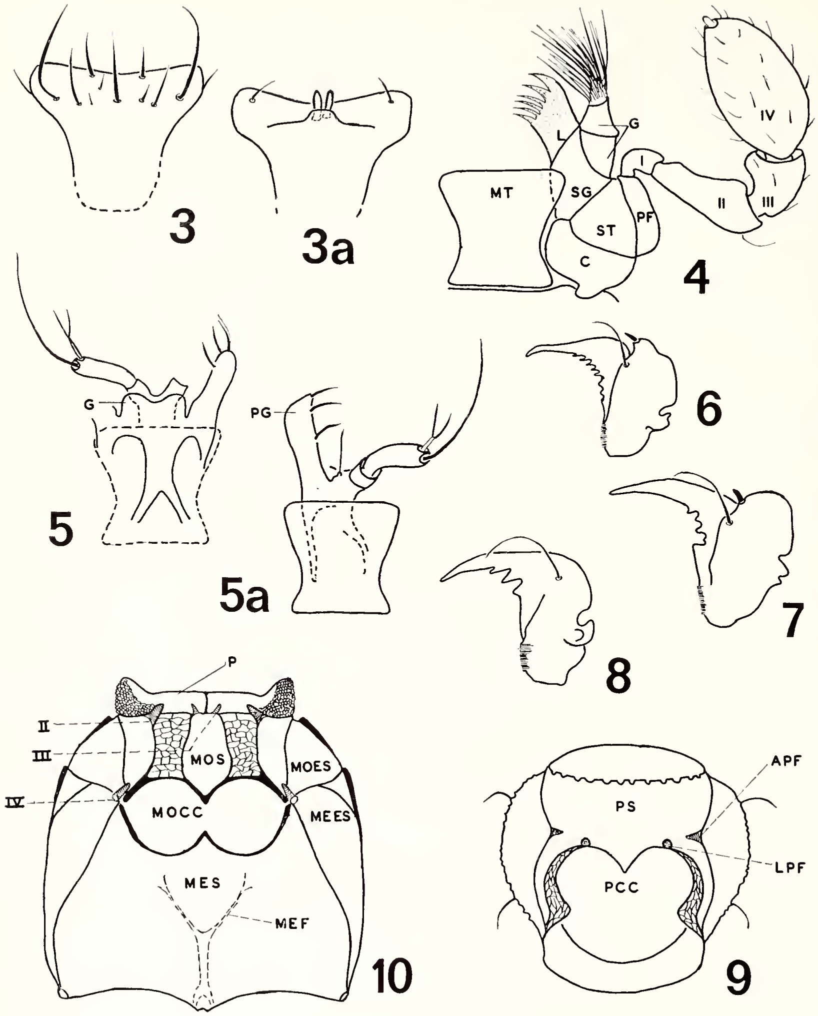
[2] The full form of the anterior prosternal foveae is best seen on slide preparations at 400 ×; by comparing them with the lateral prosternal foveae (present in both *Euplectus* and *Pycnoplectus*) their presence or absence is obvious.

DESCRIPTION: Body form elongate, more or less parallel-sided and flattened. Average length, including head, thorax, and abdomen of dry, point-mounted specimens about 1.3 mm. Color uniform light brown in tenerals, darkening in older individuals, quite red-brown in some. Integument punctulate with sparse, long, golden, aciculate setae.

Head: Widest through eyes, tempora well rounded; front depressed with sulciform impression; vertex flat or convex with two nude foveae connected to frontal impression by sulci, often forming U-shaped impression with frontal sulcus; small fovea behind each antennal tubercle. Eyes salient, near middle of lateral side of head, with about forty medium sized facets. Ventral surface with aciculate subappressed, sparse setae, usually pointed anteriorly; smooth to coarsely punctate. Antennae 11 segmented, not geniculate, slightly shorter than combined head-pronotum length; segment 1 cylindrical, slightly larger than globular second, 3–7 smaller moniliform, 8 slightly transverse; club of last three segments, 9–10, progressively larger and transverse, 11 largest, conical, apex divided into two sensory depressions which contain beta sensilla (fig. 12). Park (1950, p. 53) figures the placement of the sensilla in *E. confluens*. Labrum bearing setae, variable in shape, outer margin barely concave in *E. confluens*; ventral surface with small median tubercle from which two sensory cones project to just beyond distal margin (fig. 3a). Their position indicates tasting function. Mandibles pointed, from three to eight teeth on internal ramus, and fine molar development; middorsal face with single long seta, but never with spinoid seta (fig. 8). Maxilla as figured (fig. 4) with little interspecific variation; palpi 4 segmented, terminal sensory cone figured by Park (1950, p. 53). Labium (fig. 5) with glossae reduced to two central setae on membranous lobes and flanked by membranous paraglossae; palpus with two strong setae, inner seta bifurcate.

Thorax: Prothorax cordiform, convex disc always with midlongitudinal sulcus and midantebasal foveoid depression which may join subpubescent, lateral antebasal foveae by well defined to obsolete transverse sulcus. Prosternum not carinate, lateral prosternal foveae (LPF) and anterior prosternal foveae well defined, LPF pubescent. Procoxal cavities confluent; surface posterolateral to cavities reticulate (fig. 9).

Mesosternal and metasternal fields (as shown in fig. 10); mesocoxal cavities confluent; metacoxal cavities contiguous; preplectoid area laterally imbricate where it articulates with prothorax. Mesosternum divided into three parts by two reticulate areas anterior to coxal cavities; all foveae pubescent: two median mesosternal foveae (MMF or III), lateral mesosternal foveae (II), and lateral mesocoxal



Figs. 3–10. Figs. 3–5. *Euplectus confluens* LeConte. 3. Labrum. 3a. Ventral view. 4. Maxilla, ventral view. MT—mentum, C—cardo, ST—stapes, PF—palpifer, I–IV—palpus, SG—subgala, G—galea, L—lacinia. 5. Labium, dorsal view. G—glossa. 5a. Labium, ventral view. PG—paraglossa. Fig. 6. *Pycnoplectus sexualis* (Casey), right mandible, dorsal. Fig. 7. *Pycnoplectus linearis* (LeConte), right mandible, dorsal. Figs. 8–10. *Euplectus confluens* LeConte. 8. Right mandible, dorsal. 9. Prothorax, ventral. PS—prosternum, PCC—procoxal cavities, APF—anterior prosternal foveae, LPF—lateral prosternal foveae.

foveae (IV); longitudinal impression of metasternum supports metasternal furca (dotted lines fig. 10). Elytron with pubescent subhumeral fovea and associated plicoid entire stria; disc with four antebasal foveae (slide examination at 430 × may be necessary to discriminate them), sutural fovea with entire stria, juxtahumeral and humeral foveae may be united and associated with stria which stops midway in elytral length. Metawings membraneous, lacking veins except in proximal third (fig. 18), surface microsetate, posterior margin bears long alar setae, wing length comparable to total body length, 1.2 mm in *E. confluens.*

Legs: Not modified in *Euplectus*, procoxae and mesocoxae globular, metacoxae triangular, extending to lateral margin; mesotrochanters relatively short, articulated with femur in brachysceline form; femora (especially mesofemora) relatively swollen in males; tibiae fusiform or distally expanded, mesotibia with minute mesial laminoid lobe or spine at apex; tarsi 3 segmented, segment 1 short, 2–3 relatively very long, 3 bearing single claw.

Abdomen: Dorsum with five visible segments, actually six present, but first actual tergite or hypotergite covered by elytra; lateral margins strong, first three tergites subequal, fourth largest; fifth more rounded —obtuse; first two tergites bear two divergent basal carinae, area between carinae basally depressed and densely pubescent, small fovea at base of each carina. Lateroanterior angle of hypotergite and first sternite of both sexes bears stridulatory organs as reported by Park (1963, p. 183) for *Actiastes wagneri.* Left tergal area of female *E. confluens* (fig. 15) differs from *A. wagneri* in possessing many small spines arranged in long rows on margin, and in transverse groups mesially; elytra provided with small terminal striae on inner surfaces, thus stridulations are produced by movement of elytra over sternal and tergal imbrications. Six sternites in females, all simple and undivided, first five subequal, sixth triangular. Males with seven visible sternites, seventh relatively large, and always divided asymmetrically into right and left terminal plates. At copulation these two plates move ventrolaterally to allow extension of aedeagus; dividing carina arcuate to morphological left; fourth, fifth, and sixth sternites in males

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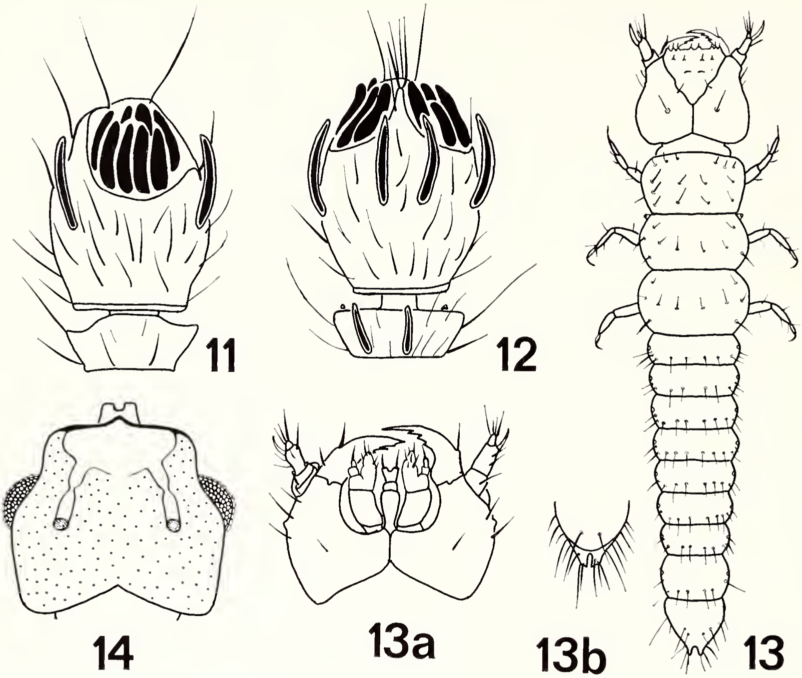
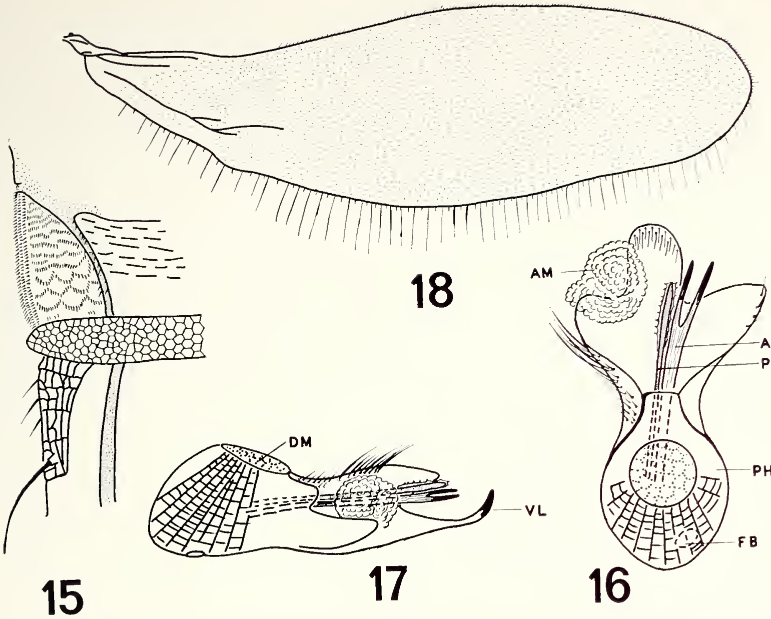
10. Mesothorax and metathorax, ventral. P—proplectoid area, MOS —mesosternum, MOES—mesoepisternum, MOCC—mesocoxal cavities, MES—metasternum, MEES—metaepisternum, MEF—metasternal furca, II—lateral mesosternal fovea, III—median mesosternal fovea, IV—lateral mesocoxal foveae.



Figs. 11–14. Figs. 11 & 14. *Leptoplectus pertenuis* (Casey). 11. Tenth and eleventh antennal segments showing placement of alpha sensilla within anteapical fossa and beta sensilla on surface. 14. Head, dorsal view. Figs. 12 & 13. *Euplectus confluens* LeConte. 12. Tenth and eleventh antennal segments showing placement of alpha and beta sensilla in double fossae. 13. Larva, modified from Böving and Craighead (1931), dorsal. 13a. Ventral view of head. 13b. Ventral view of terminal abdominal segment.

variously modified by fossae, laminoid projections, setal tufts, and membranous lobes.

Aedeagus: Basal capsule (figs. 16–17) or phallobase bulbus, elongate with dorsal membrane-covered area and ventral *foramen basalis* with sperm duct; dorsal membrane held by numerous muscle bands which insert on base of capsule, and which at contraction, depress membrane and exsert intromittent organs by hydrostatic pressure. Distal armature with ventral lobe, lateral lobes, anteapical membrane, phallus, but lacking accessory phallus. Ventral lobe extends farthest apically, truncate or spatulate with numerous terminal canaliculi that end distally in micropores. Lateral lobes variable, either



Figs. 15–18. Figs. 15 & 18. *Euplectus confluens* LeConte. 15. Presumed stridulatory apparatus on first actual tergite (hypotergite) and first visible tergite, left dorsal aspect. 18. Metawing of female, 1.2 mm long. Figs. 16 & 17. Hypothetical pycnoplectoid aedeagus. 16. Dorsal. AM—anteapical membrane, P—phallus, AP—accessory phallus, PH—phallobase (basal capsule), FB—basal opening. 17. Lateral. DM—dorsal membranous foramen, VL—ventral lobe.

may be reduced so that entire aedeagus appears asymmetrically skewed to right or left, one or both lobes bear setae. Anteapical membrane often conceals details of phallus sometimes positioned beneath it; bearing spines, tubercles, granules or smooth. Phallus often bifurcate or otherwise modified.

Discussion of Development: Very little is known of pre-imagine pselaphids; adults have been collected *in copulo*, and mating behavior described in *Adranes taylori* (Arke and Hill, 1973, p. 532), but females have not been seen laying eggs. The structure of eggs and development is yet unknown. Böving and Craighead (1931, p. 30, pl. 9) show figures of the larvae of two pselaphids, *Batrisodes monstrosus* and *Euplectus confluens*, and Jeannel (1950, p. 23) gives a description of these and points out certain tribal differences. I have found larvae of *E. confluens* associated with adults only occasionally in alcohol berlesates, but larvae have not been collected alive. One *E. confluens* larva, from a maple tree hole, Illinois, Will County, Monee, Raccoon Grove collected in December 1959 by Walter Suter, was compared with published descriptions. The following description differs from Jeannel's with regard to the number of antennal segments and mandibular teeth. The portions in brackets are taken from Jeannel, since these were obscured in the specimen I examined. Jeannel's description, I believe, was compiled from Böving and Craighead's drawing and not from an actual specimen.

LARVA OF E. CONFLUENS: Length 1.23 mm (fixed), form slender elongate; head rounded with narrow cervicum; [epicranial suture straight, connecting to slightly sinuate frontal sutures]; no stemmata, but small tubercle on side of head; clypeus transverse, three tubercles with short setae in each lateral third; labrum with two median sensilla; antenna inserted in circular sockets, apparently 2 segmented, first segment stout-cylindrical, second not as wide but slightly longer bearing an elongate hyaline cone, three-fourths length of segment on distal face, small tubercle on mesial distal face (fourth segment of Jeannel); mandibles short, arcuate, with three acute teeth on internal ramus; maxillae short and broad; cardo large; laciniae in form of broad lobe which bears 5–7 mesoterminal spines; palpi short, triarticulate, inserted on external face of maxillae; [labrum represented by mentum and distinct submentum, mentum inserted on straight submentum. No gula. Palpi two segmented; no distinct ligula]. Thoracic segments subequal; abdominal segments slightly narrower, first seven alike, eighth little longer than seventh; ninth subtriangular, terminating in two small nonsegmented urogomphi; lateral spiracle between first and second thoracic segments, and on each abdominal segment; setae simple; legs slender, tibiae weakly spined, single tarsal claw (fig. 13).

KEY TO THE SPECIES OF EUPLECTUS MALES OF UNITED STATES AND CANADA

1. Fourth sternite[3] with posteriorly directed, median setal tuft (figs. 23–26) .... *confluens* group 2

   Fourth sternite lacking median tuft, simple and unmodified, fifth sternite unmodified or with simple depression which merges with depression of sixth sternite (figs. 36–39) .... *californicus* group 5

2. Apical margin of fourth sternite with median setal tuft flanked

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[3] Sternite characters are best seen on slide mounts at 100 × to 400 ×; this key is of limited use on point mounted specimens unless they are viewed with superior optics and adequate illumination.

each side in middle fourth of segment, by rounded, black lamina (figs. 23–24) 3

Apical margin of fourth sternite with tuft not flanked by black lobes in middle fourth of segment (figs. 25–26) 4

3. Size relatively small; mesotrochanter spined; fourth sternite with black lamina in lateral fourth; aedeagus as illustrated (figs. 21 and 23) .... *filiformis* (Casey)

Size relatively larger; mesotrochanter not spined; fourth sternite without black lamina in lateral fourth; aedeagus as illustrated (figs. 22 and 24) .... *longicollis* Casey

4. Sternites relatively flattened; lateral third of fourth sternite with prominent lamina extending slightly over fifth sternite; fifth sternite with rounded clusters of strongly recurved setae in basal fossae (fig. 25) .... *karsteni* (Reichenbach)

Sternites relatively tumid; lateral third of fourth sternite with setiferous swelling, margin without prominent lamina; fossae of fifth sternite with sparse setal clusters (fig. 26) .... *confluens* LeConte

5. Median impression of sixth sternite small, in medial fourth, containing entirely within impression anteapical transverse row of six to 12 papilliform sensilla (fig. 39); left lateral lobe of aedeagus with thumb-like projection, anteapical membrane bearing numerous long spikes or spines (figs. 30–31) .... *duryi* Casey

Median impression of sixth sternite larger, tubercles or papilliform sensilla not limited to transverse row within impression, but in diagonal row or contiguous cluster at posterior flank; aedeagus not as described, left lateral lobe lacking thumb, anteapical membrane not spiniferous 6

6. Papilliform sensilla of sixth sternite in diagonal row at margin of impression (figs. 36–38) 8

Sensilla at impression margin of sixth sternite in contiguous cluster or replaced by rounded tubercle 7

7. Angle of impression of sixth sternite bearing rounded tubercle, lateral margins of impression evenly carinoid (fig. 35); surface of head coarsely punctate; aedeagus elongate, without long setae (fig. 27) .... *californicus* Casey

Angle of impression of sixth sternite with contiguous cluster of sensilla, margins not carinoid (fig. 34); surface of head sparsely to moderately punctate; aedeagus short, ventral lobe broadly expanded, right lobe with a few anteapical setae and short spines (fig. 33) .... *signatus* (Reichenbach)

8. Head with medium punctations ventrally; lateral tumulus of sixth sternite bearing long sensilla and many long setae (fig. 38); left lateral lobe of aedeagus with short sparse setae in tridirectional groups (fig. 32) .... *elongatus* Brendel

Head coarsely punctate ventrally; row of sensilla lacking long setae; aedeagus not as described 9

9. Prosternum coarsely punctate, as for gula; median impression of sixth sternite narrowing apically; left lateral lobe of aedeagus with long setae, several extending beyond deeply incised ventral lobe (fig. 28) .... *acomanus* Casey

Prosternum less coarsely punctate than gula; median impression of sixth sternite narrowing to base; left lateral lobe of aedeagus with short setae, ventral lobe not deeply incised (fig. 29) .... *idahoensis* Park & Wagner

CONFLUENS GROUP

Fourth sternite of males with posteriorly directed, median tuft of long setae (figs. 23–26); aedeagus with U-shaped process on anteapical membrane (figs. 19–22).

The species in this group present a difficult taxonomic and zoogeographic puzzle which I have not solved. *E. karsteni* has a Holarctic distribution and bears the group name in Europe (Jeannel, 1950, p. 105; Karaman, 1962, p. 161). I prefer *confluens* as a group name to represent the most abundant eastern Nearctic species in this complex, and I feel that *karsteni* is an introduced species. Virtually nothing is known about gene flow within the species of the *confluens* group, although some morphologically distinct demes of *confluens* and *longicollis* are sympatric (in fact, occupy the same beech tree holes), in southern Illinois. The male venter may be more reliable than the aedeagus for species separation, and detailed comparisons with European congeners should be made. The species seem to be found most frequently in tree holes in mature eastern climax deciduous forests.

Euplectus confluens LeConte

Euplectus confluens LeConte, 1850, p. 105. Type locality: Cambridge, Mass., Type female MCZC no. 6189. Subsequent references: Casey, 1884, p. 105. Brendel and Wickham, 1890, p. 69 (distr. rec., Iowa). Blatchley, 1910, p. 332 (descript.). Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation, distr. data). Bowman, 1934, p. 27 (descript.). Park *et al.*, 1950, p. 39, 52 (ecol., figure, distr. rec., eastern North Amer.). Park and Wagner, 1961, p. 16, 364 (key ref., distr. recs., figures, Juliaetta, Idaho; [Montreal, Canada, not *E. confluens*, but *E. karsteni*]).

DISCUSSION: This has been the most frequently collected species in the eastern deciduous Nearctic. The relatively tumid male venter and lack of prominent projecting laminae of the fourth sternite are diagnostic in most populations. In a few populations the males are dimorphic; the fourth sternite has a lateral concave glabrous apical margin, which may be darkened and project slightly over the fifth.

MEASUREMENTS OF TYPE FEMALE: Head .246 mm long × .352 mm wide, pronotum .316 mm long × .352 mm wide, elytra .460 mm long × .440 mm wide, abdomen .580 mm long × .440 mm wide, tergite ratio 1-1-1-1.5-1.2, basal abdominal carinae separation .088 mm. Measurements of 10 males of one deme from Dixon Springs, Pope County, Illinois: head mean length .219 × mean width .291, pronotum mean length .626 × mean width .281, elytra mean length .386 × mean width .397, abdomen mean length .432 × mean width .357, antenna .389 mm long.

Head: Surface flattened, moderately punctate, ambient frontal sulcus shallow, vertexal foveae small, nude; ventral surface moderately punctate; eleventh antennal segment with two apical fossae, each bearing four large beta sensilla, eight smaller, long alpha sensilla in center of segment and ringed around it (Park, 1950, p. IV).

Thorax: Pronotum with small elongate discal impression, antebasal impression weakly connected with lateral antebasal pubescent foveae; anterior prosternal foveae present, prosternum punctulate; elytron with entire sutural stria, one-half discal stria, antebasal foveae apparently two, but on close examination four are found: humeral, juxtahumeral, sutural, and juxtasutural; subhumeral fovea present; metasternum sparsely punctate.

Legs: Simple, as for genus.

Abdomen: First two tergites with slightly divergent basal carinae, each with basal fovea; female as described for genus, male venter diagnostic: fourth sternite with median tuft of long setae which extends over fifth and recurves at end, in each lateral third a small tumulus with sparse setae and which, in some populations, has slight concave sublaminoid projection (but never as great as that of *karsteni*); fifth sternite medially impressed, each side bearing cluster of anteroventrally directed setae (similar to *karsteni* but setae shorter and not as abundant); sixth with median subreniform impression four-fifths width and row of three to four small sensilla each side of center apical margin (in 30 specimens over total range, average 6.48, range five to eight total sensilla); seventh sternite with carina arcuate to left (fig. 26).

Aedeagus: Left lateral lobe (fig. 19) with from three to 10 setae (in 34 males over total range, average 4.8, modal number 4), but tends to have fewer than *karsteni* or *longicollis*.

MATERIAL EXAMINED: *Massachusetts*: MIDDLESEX CO., Cambridge, 1 female (Type, MCZC). *New Hampshire*: SULLIVAN CO., 25 July 1964, Steeves, 5 males, 17 females, split maple debris (HS).

Washington D.C.: 3 Sept. 1964, Suter, 1 male, forest floor; U.S. National Arboretum, 27 July 1959, Wagner and Suter, 3 males, 1 female, maple TH; Rock Creek Park, 26 Jan. 1967, Suter, 1 male, 4 females, linden TH (JAWC). *Maryland*: CARROL CO., Marriottsville, 26 July 1959, 1 male, ash TH (JAWC); MONTGOMERY CO., Glen Echo, 6 June 1964, Suter, 1 male, beech TH (JAWC). *Delaware*: NEW CASTLE CO., Christiana, 31 May 1953, R. Howard, 1 male (OP). *Pennsylvania*: BLAIR CO., Duncansville, 2 males, 8 females, beech log hole (JAWC); CENTRE CO., Boalsburg, Wildcat Gap, 23 May 1959, F. Fletcher, 6 males, 11 females, oak TH (JAWC), above Bear Meadows, 11 July 1961, 2 males, 8 females, birch TH, 1 male, 2 females, oak TH (JAWC); SULLIVAN CO., Forksville, World's End State Park, 11 July 1959, D. Reichle, Suter, Wagner, 9 males, 45 females, beech TH (JAWC); FULTON CO., Breezewood, 21 Nov. 1961, H. Dybas, 1 male, 2 females, TH; CRAWFORD CO., Tryon's Farm, Coneaut Lake, 12 July 1966, Suter, 1 male, 2 females, beech TH; 1 male, maple TH (JAWC); WESTMORELAND CO., E. of Youngstown, Chestnut Ridge, 3 males, 5 females; 1 male, 3 females; 16 Sept. 1961, Wagner, 14 males, 18 females, beech TH; 11 July 1961, Wagner, 3 males, 10 females, maple TH (JAWC), 16 Sept. 1964, Suter, 1 male, 1 female, beech TH; 11 males, 22 females, stump mold (JAWC); Latrobe, St. Vincent, 28 July 1959, Suter and Wagner, 1 male, 6 females; 8 males, 13 females, beech TH; 1 male, 3 females, maple TH (JAWC), 1 male, 1 female (MCZC), 2 males (OSUC), 1896, 2 males, F. C. Fletcher collection (OP). *Ohio*: HAMILTON CO., Cincinnati, Burnett Woods, 27 Aug. 1959, Wagner and Suter, 7 males, 15 females, beech TH (JAWC); LORAIN CO., Oberlin, 29 July 1959, Wagner and Suter, 38 males, 45 females, maple TH (JAWC), 29 July 1959, Suter, 1 male, oak TCH (OP). *Kentucky*: HENDERSON CO., Audubon State Park, 28 Aug. 1959, Wagner and Suter, 4 males, 2 females, beech TH (JAWC). *Tennessee*: BLEDSOE CO., Fall Creek Falls State Park, 1 Sept. 1961, Steeves, Suter, Wagner, 4 males, 10 females, TH (JAWC); FRENTRESS CO., Jamestown, Jordan Motel, 13 Apr. 1963, Steeves, 1 male, maple TH (HS); FRANKLIN CO., Sewanee, 8 June 1958, 11 plus males, 3 plus females, hollow oak (HS, OP, JAW); HUMPHREYS CO., Hustburg, 5 June 1956, W. Snow, 2 males, 6 females, beech TH (OP); OVERTON CO., Standing Stone State Park, 2 July 1961, Steeves, 9 males, 18 females, beech TH with 1 male *E. longicollis* (HS); ROANE CO., Oak Ridge, AEC Controlled Area, 22 Aug. 1955, 1 male, 4 females, beech TH (OP); SEVIER CO., Great Smoky Mountains National Park, 4 males, 11 females; 7 males, 17 females; 1 male, 2 females; 5 males, 12 females; 3 males, 5 females; 3 males, 4 females, tree holes (OP), 15 Sept. 1953, H. Dybas, 1 male, buckeye TH (FMNH). *Alabama*: CLAY CO., Talladega National Forest, 23 Sept. 1962, Steeves, 1 male, 1 female, tulip TH (HS); COLBERT CO., Maud, 15 June 1963, Steeves, 1 male, yellow poplar TH (HS); JACKSON CO., Pisgah, nr. Saltpeter Cave, 29 June 1958, Steeves, 2 plus males, 2 plus females, yellow poplar TH (HS, OP, JAW); JEFFERSON CO., Clay, nr. McClunney Alabama Caverns, 4 Mar. 1961, Steeves, 7 males, 8 females, oak TH (HS); LAWRENCE CO., Bankhead National Forest, Bee Branch Scenic Area (HS); MADISON CO., Maysville, Sharp's Cove, nr. Aladdin Cave, Suter, 2 males, 2 females, beech TH (JAWC), 11 May 1963, Steeves, 3 males, 12 females, beech TH (HS); Monte Sano State Park, 9 Apr. 1955, A. and H. Howden, 6 males, 8 females, oak TH (OP); MARSHALL CO., Grant, 25 May 1958, Steeves, 1 plus male, 2 plus females, beech TH (HS, OP, JAW); Union Grove, 2.5 mi. N., outside Old Blowing Cave, 27 June 1967, S. Peck and Fiske, 2 males, 9 females, beech TH (FMNH); PIKE CO., The Pocosin, nr. Troy, 6 Aug. 1961, Steeves and Patrick, 1 male, 9 females, oak TH (HS); SHELBY CO., Oak Mountain State Park (HS); nr. Helena (HS); WALKER CO., Devil's Ladder, nr. Jasper (HS). *Georgia*: RABUN CO., Rabun Bald, 30 May 1964, Steeves, 1 male, 2500 ft., base of cleft hemlock (HS). *Indiana*: MONTGOMERY CO., Shades State Park, 8 May 1961, Wagner, 2 males, 7 females, beech TH (JAWC); Pine Hills Extension-Shades, 24 Nov. 1961, Suter, 6 males, 13 females, beech TH; 23 Aug. 1960, H. Dybas, 4 males, 6 females, tulip poplar TH (JAWC); LAPORTE CO., Otis, 14 July 1960, Suter, 4 males, 2 females, beech TH (JAWC); Smith, 1 male, 1 female; beech TH, 10 Nov. 1959, Suter, 9 males, 11 females, maple TH, 3 females, black cherry TH, 1 female, sycamore TH (JAWC), 9 April 1956, H. S. Dybas, 10 males!, maple TH (JAWC); PARKE CO., Turkey Run State Park, 4 Nov. 1943, M. W. Sanderson, 1 male, soil cover in woods (OP), 18 Aug. 1959, Suter, 1 male, 2 females, sycamore TH; 2 males, 8 females; 17 males, 30 females, beech TH, 23 Sept. 1959, Suter, 3 males, 8 females; 1 male, 2 females, maple TH (JAWC); PORTER CO., Indiana Dunes State Park, 25 Aug. 1952, H. S. Dybas, 4 males, 2 females (OP); HANCOCK CO., nr. Cumberland, Wolfs Woods, 24 June 1966, R. Miller, 6 males, 9 females, maple TH, 8 males, 9 females, beech TH (JAWC). *Michigan*: ALLEGAN CO., Glenn, 16 Aug. 1949, S. Auerbach, 8 males, 22 females, TH; Douglas, 4 July 1949, Auerbach, 13 males, 47 females; 5 males, 7 females, TH (OP); ALGER CO., AuTrain, 6 mi. W. Shelter Bay, 16 Aug. 1953, Dybas, 1 male (JAWC); LIVINGSTON CO., E. S. George Reserve, 4 May 1960, Suter, 3 males, 4 females, squirrel nest on oak branch (JAWC); MUSKEGON CO., Montague, Pigeon Hill, 8–12 Aug. 1962, Wagner, 2 males, 5 females, red oak TH; 3 males, 10 females, beech

TH (JAWC); CHIPPEWA CO., Eckerman, 2 Sept. 1966, Suter, 1 male, 1 female, maple TH (JAWC); LUCE CO., 5 mi. W. McMillan, 31 Aug. 1966, Suter, 1 male, beech TH (JAWC); GRAND TRAVERSE CO., Bowers Harbor, Peninsula Drive, 23 Aug. 1966, Suter, 3 males, 15 females, maple TH; 28 Aug. 1966, Suter, 6 males, 7 females, beech TH (JAWC); BERRIEN CO., Buchanan, 9 Oct. 1948, S. Auerbach, 22 males, 23 females, (OP); Lakeside, Warren Woods State Park, Jan.–Dec. 1948–1953, Auerbach, Corley Park, 23 males, 41 females; 1 male, 9 females; 2 males, 7 females; 1 male, 5 females; 2 males; 3 males, 1 female; 3 males, 5 females; 3 males, 8 females; 9 males, 16 females, tree holes (OP), 27 males, 47 females; 3 Oct. 1959, Wagner, 6 males, 15 females, 10 Nov. 1959, Suter, 5 males, 18 females; 1 male, 9 females; 15 May 1961, Suter, 4 males, 10 females; 3 May 1961, Suter, 6 males, 7 females; 25 June 1966, Suter, 1 male, 16 females, all beech TH; 10 Nov. 1959, Suter, 21 males, 61 females, elm TH (JAWC); Stevensville, 1 male, hemlock TH (JAWC). *Illinois*: CHAMPAIGN CO., Urbana, Brownfield Woods, 6 males, 8 females, basal TH (INHS), Busey's Pasture, 1 male, 3 females, TH (INHS), Trelease Woods, 1 male, 7 females, TH (INHS), 1 male, 2 females TH (OP); COOK CO., Des Plaines, Carle Woods, 15 Dec. 1959, Suter, 16 males, 21 females, linden TH; 28 Mar. 1959, Suter, 4 males, 2 females, oak TH; 12 June 1963, Wagner, 1 male, 5 females, linden TH (JAWC); Palos Park, 13 Aug. 1949, S. Auerbach, 1 male (OP); Willow Springs, Paw Paw Woods, 23 Apr. 1960, Wagner, 1 male, oak TH; 13 July 1963, Wagner, 3 males, 7 females, maple TH, 1 male, 3 females, maple TH-mammal nest (JAWC); JERSEY CO., Pere Marquette State Park, Grafton, 31 Aug. 1959, Wagner, 7 males, 6 females, white oak TH (JAWC); LAKE CO., Channel Lake, Oak Point State Park, 16 Sept. 1960, Suter, 1 male, 4 females, elm TH (JAWC); LAWRENCE CO., Pinkstaff, 21 Mar. 1950, L. H. Tiffany, 1 male, 12 females, TH (OP); MADISON CO., Alton, 4 July 1959, Wagner, 1 male, 1 female, TH (JAWC); MCLEAN CO., Funks Grove, 2 Sept. 1962, Suter, 1 male, stump (JAWC); WILL CO., Monee, Raccoon Grove, 18 July 1959, Suter, 7 males, 6 females, maple TH; 1 male (OP), 7 May 1959, Suter, 9 males, 10 females, linden TH; 1 male, oak TH; 13 Sept. 1952, H. S. Dybas, 1 male, 5 females, maple TH (JAWC); TAZWELL CO., E. Peoria, 5 mi. N., 27 Dec. 1966, Suter, 1 male, 2 females, maple TH (JAWC); PULASKI CO., Villa Ridge, 8 Sept. 1959, Wagner and Suter, 5 males, 4 females, beech TH (JAWC); UNION CO., Wolf Lake, Pine Hills Ecology Area, 29–30 Aug. 1959, Wagner and Suter, 12 males, 20 females; 3 males, 4 females; 12 males, 19 females; 6 males, 5 females; 2 males, 3 females; 4 males, 3 females; 4 males, 13 females, all beech TH (JAWC). *Wisconsin*: ADAMS CO., Friendship, 3 May 1959, Wagner and Suter, 3 males, 7 females; 26 June 1959, 2 males, 9 females, oak TH; 19 Oct. 1966, Suter, 1 male, cottonwood TH (JAWC); GREEN CO., Twin Grove, 18 July 1959, Suter, 1 male, 1 female, linden TH (OP); SAUK CO., Devils Lake State Park, 23 Oct. 1960, Wagner, 2 males, 3 females, oak TH (JAWC). *Arkansas*: WASHINGTON CO., 29 Oct. 1939, M. W. Sanderson, 2 males, 9 Mar. 1940, 1 male (OP). *Iowa*: JACKSON CO., Maquoketa Caves State Park, 25 July 1968, S. Peck, 1 male, upland forest litter (JAWC). *Idaho*: LATAH CO., Juliaetta, 17 May 1952, W. F. Barr, "several," 1083 ft. elevation (Univ. of Idaho). The total number examined was approximately 1722 (607 males, 1115 females with a ratio of 1 male to 1.83 females).

HABITAT: The preferred habitat is the loose, moist, decayed wood debris within hollow trees, especially basal tree holes in beech (*Fagus grandifolia*) and maple (*Acer saccharum*).

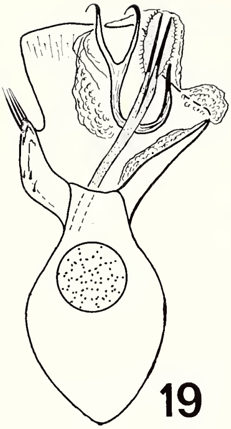
Euplectus longicollis Casey

Euplectus longicollis Casey, 1884, p. 99. Type locality: Deer Park, Garrett Co., Maryland, Type male USNM. Subsequent references: Brendel and Wickham, 1890, p. 65 (descript., distr. data). Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 27 (descript., key ref.).

DISCUSSION: This species was described from a single male. It is most closely related to *confluens* and although male fourth and fifth sternal characters provide distinct separation, the occurrence of both species in the same tree holes of beech-maple forests in Parke County, Indiana and Union County, Illinois suggests a lack of gene flow between them. I have not been able to recognize any intermediate phenotypes.

MEASUREMENTS OF TYPE MALE: Head .264 mm long × .300 mm wide, pronotum .316 mm long × .306 mm wide, elytra .440 mm long × .426 mm wide, abdomen .440 mm long × .404 mm wide, tergite ratio 1-1-1-2-2, sternite ratio ?-.5-1-1-.2-.5-1, basal abdominal carinae separation .088 mm first, .105 mm second, antenna length .404 mm.

DESCRIPTION: General habitus identical to *confluens*, separated from *confluens* by following characters. Male venter: fourth sternite with median apical setal tuft which extends posteriorly over fifth, darkened lamina on each side of tuft; fifth sternite medially impressed, each side bearing cluster of sparse setae (as in *confluens*), apical margin simple; sixth sternite with median subreniform impression and row of three to four small sensilla each side of center apical margin (in eight specimens from Indiana, Illinois, Pennsylvania, average 7.3,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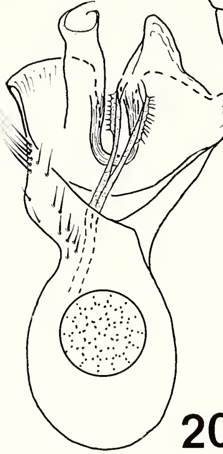
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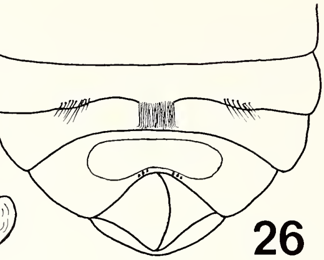
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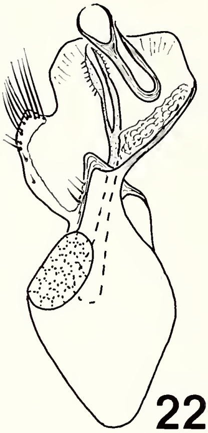
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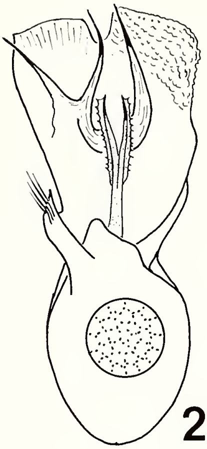
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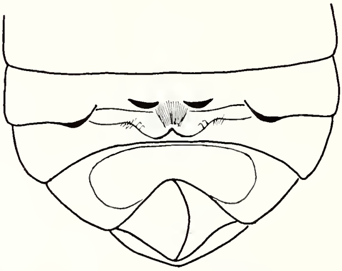
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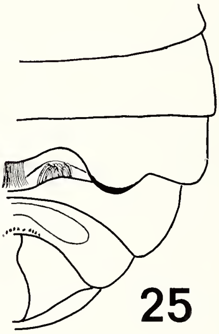
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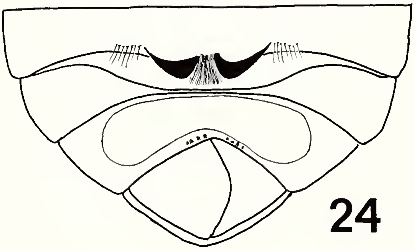
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FIGS. 19–26. *confluens* group. Figs. 19 & 26. *Euplectus confluens* LeConte. 19. Aedeagus. 26. Venter of male. 20 & 25. *Euplectus karsteni* (Reichenbach). 20. Aedeagus. 25. Venter of male. Figs. 21 & 23.

range from five to eight total sensilla); seventh sternite with carina arcuate to left (fig. 24).

Aedeagus: Left lateral lobe (fig. 22) with four to 10 setae (in 10 specimens over total range, average 7, modal number 4), average higher than for *confluens*.

MATERIAL EXAMINED: CANADA: *Ontario*: ESSEX CO., Tilbury, 5 Sept. 1967, 1 male, 1 female, sifting, K. Stephan (JAWC).

UNITED STATES: *Maryland*: GARRETT CO., Deer Park, 1 male (Type, USNM), 25 July 1959, 1 male, Wagner and Suter, sawdust (topotype, JAWC); MONTGOMERY CO., Island SE of Plummers, 8 Sept. 1964, 1 male, litter at log, Suter (JAWC). *Washington, D.C.*: United States National Arboretum, 27 July 1959, 1 male, 1 female, maple TH (JAWC). *Pennsylvania*: PHILADELPHIA CO., Frankford, 1 male, 1 female (OSUC); WESTMORELAND CO., Latrobe, St. Vincent, 28 July 1959, 4 males, 4 females, log mold (JAWC), 1 male, 1 female, black cherry tree crotch, (OP), 2 males, 2 females, Fall Collection (MCZC), 4 males, (OSUC). *Ohio*: HAMILTON CO., 2 males (CMNH); MAHONING CO., Swamp, N. Jackson, 1 Sept. 1964, 3 males, 1 female, beech stump, Suter (JAWC). *South Carolina*: FLORENCE CO., Florence, 29 Mar. 1960, 3 males (V. M. Kirk). *North Carolina*: MACON CO., Norton, Coweeta Hydrology Lab., 31 May 1964, H. R. Steeves, Jr. and J. D. Patrick, Jr., 4 males, 5 females, 2250 ft., in sawdust, with *E. filiformis* (HS). *Tennessee*: FENTRESS CO., Jamestown, Jordan Motel, 13 Apr. 1963, Steeves and Patrick, 1 male, 3 females, yellow poplar TH; 1 male, maple TH, with 1 male *E. confluens* (HS); OVERTON CO., Standing Stone State Park (HS); PICKETT CO., Pickett State Park, (HS). *Alabama*: JACKSON CO., Pisgah, nr. Saltpeter Cave, 29 June 1958, Steeves, 1 male, 2 females, hollow yellow poplar debris (HS); LAWRENCE CO., Bankhead National Forest, Bee Branch Scenic Area (HS). *Kentucky*: HENDERSON CO., Audubon State Park, 28 Aug. 1959, Wagner and Suter, 3 males, 2 females, beech TH (JAWC). *Indiana*: MONTGOMERY CO., Shades State Park, 18 Aug. 1959, 2 males, beech TH, 23 Sept. 1959, Wagner, 3 males, 5 females, maple TH, 8 May 1961, Suter, 3 males, 5 females, maple TH (JAWC). *Illinois*: JACKSON CO., Giant City State Park, 22 Aug. 1944, M. W. Sanderson, 1 male, 1 female, floor litter (OP); POPE CO., Herod, 12 Oct. 1933, Frison and Ross, 6 males, 2 females, log mold,

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Euplectus filiformis (Casey). 21. Aedeagus. 23. Venter of male. Figs. 22 & 24. *Euplectus longicollis* Casey. 22. Aedeagus, three-quarter dorsal view. 24. Venter of male.

(INHS), 12 Oct. 1933, H. Ross, 1 male, 1 female (OP); UNION CO., Ware, 1 male, 3 females, log mold (INHS), 3 Feb. 1934, Frison and Mohr, 1 male, log mold (OP); Wolf Lake, Pine Hills Ecology Area, 29–30 Aug. 1959, Wagner and Suter, 39 males, 44 females; 11 males, 18 females; 1 male, 4 females; 9 males, 8 females, all beech TH (JAWC). The total number examined was about 227 (113 males, 114 females).

HABITAT: The preferred habitat is tree holes and log mold, particularly in climax forests.

Euplectus filiformis (Casey), new combination

Leptoplectus filiformis Casey, 1908, p. 268. Type locality: St. Vincent, Latrobe, Westmoreland Co., Pennsylvania. Type male, USNM no. 38608. Subsequent references: Raffray, 1911, p. 35 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 35 (descriptive key).

DISCUSSION: This is a slender species which Casey placed in *Leptoplectus* perhaps because of its small size. It has nude vertexal foveae, two sensory fossae on the eleventh antennal segment, the seventh sternite has a carina arcuate to the left, and other features typical of *Euplectus*. It belongs in the *confluens* group on the basis of male venter and aedeagal form. It is the least common species in the group, and the only one with spined mesotrochanters.

MEASUREMENT OF TYPE MALE: Head .228 mm long × .270 mm wide, pronotum .228 mm long × .264 mm wide, elytra .352 mm long × .352 mm wide, abdomen .389 mm long × .340 mm wide, tergite ratio 1-1-1-1.5-1, sternite ratio .5-1-1-1-.2-1.2, basal abdominal carinae maximum separation .075 mm, antennal length .352 mm, club width .070 mm.

DESCRIPTION: General habitus as for group, but smaller size; separated from allies by following features. Legs: mesotrochanter with short spine. Male venter: fourth sternite with mesoposterior tuft of setae which converge in truncate point and recurve sharply at tips over fifth, small dark lamina laterally adjacent to tuft (as in *longicollis*, but smaller); fifth sternite with basal impression in middle third, posterior to impression transverse row of three tubercles, lateral two large, with abundant straight and recurved setae, central tubercle small, acute, not setiferous; sixth sternite with rather deep subreniform impression and row of eight small, median anteapical sensilla (one specimen only from Indiana checked for sensilla); seventh sternite arcuate to left (fig. 23).

Aedeagus: Left lateral lobe small, pointed, with about four setae, ventral lobe long, with shallow median notch, anteapical membrane bearing unusually deep "horseshoe lobe" with left ramus broadly divergent, specimens of four known localities agree with figure 21.

MATERIAL EXAMINED: *Pennsylvania*: WESTMORELAND CO., Latrobe, St. Vincent, 1 male (Type, USNM), 1 male (J. Schmitt coll'n. FMNH). *Ohio*: HAMILTON CO., Cincinnati, 1 male, 1 female (paratypes, USNM), 12 males, 7 females, four collection dates (CMNH). *Indiana*: MONTGOMERY CO., Shades State Park, Pine Hills Extension, 24 Nov. 1961, Suter leg., 1 male, hemlock floor litter, (JAWC). *North Carolina*: MACON CO., Norton, Coweeta Hydrology Lab., 31 May 1964, Steeves, 3 males, 5 females, 2250 ft. in sawdust pile with 4 males, 5 females of *E. longicollis* (HS). The total number examined was 32 (19 males, 13 females).

HABITAT: The only known habitats are hemlock floor litter and sawdust.

Euplectus (Diplectellus) karsteni (Reichenbach)

Euplectus (*Diplectellus*) *karsteni* (Reichenbach), 1816, p. 71. Type locality: central Europe. Subsequent references: Raffray, 1908, p. 87 (cat. citation), 1910, p. 229 (distr. data, descript.), 1911, p. 32 (cat. citation). Jeannel, 1950, p. 105, 116 (key ref., descript., distr. data, figs., does not agree with Raffray's variations but considers each different species). Pearce, 1957, p. 17 (key ref., distr. data). Karaman, 1962, p. 161 (descript., distr. data, figs.) Besuchet, 1974, p. 323 (key ref., distr. data, aedeagus fig., synonymies including *iowensis*).

Euplectus iowensis Casey, 1893, p. 456. Type locality: Cedar Rapids, Linn Co., Iowa (by my designation), Type male USNM no. 38623. Subsequent references: Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 28 (descript., key ref.). Park and Wagner, 1961, p. 16 (synonym of *confluens*).

DISCUSSION: Raffray listed eight synonyms with six varieties for *karsteni* in 1911; Jeannel felt that the varieties would prove to be valid species, but Besuchet (1974) later placed two more European species, *laticeps* Guillb. and *barbarus* Jeannel, and North American *iowensis* Casey in synonymy. By exchanging specimens of European *karsteni* and N. American *iowensis* with Besuchet it was evident to both of us that the latter is a synonym. The characters of the male venter and aedeagus are conspecific within ranges of variation acceptable for the genus. The Type and four paratypes of *iowensis* were labeled simply Iowa. One paratype was labeled "dar Rap" Iowa, with the edges of the label cut off. I have not seen the Type of *E. karsteni*. The description here is from Nearctic populations unless noted.

MEASUREMENTS OF IOWENSIS TYPE MALE: Head .228 mm long × .316 mm wide, pronotum .246 mm long × .299 mm wide, elytra

.404 mm long × .422 mm wide, abdomen .440 mm long × .389 mm wide, tergite ratio 1-1-1-1-2-1, sternite ratio .8-1-1-.6-.2-1.2, antenna length .404 mm.

Description: General habitus identical with *confluens*, separated from *confluens* by following characters. Male venter: relatively flattened, fourth sternite with mesoposterior tuft of setae flanked on each side by concave indentations of posterior margin which becomes darkened lamina in lateral third; fifth sternite with basal impressions complementary to indentations of fourth, within impressions dense cluster of strongly recurved setae; sixth sternite with row of five to eight anteapical sensillae each side of center (Europe: two specimens from Switzerland –12.5, 1 from France –13; North America, 1 from Montreal, Canada –12, 4 from Wisconsin –12.7, 1 from Minnesota –14, 1 from Michigan –14, 6 from Illinois –13.1; total average for 13 North American specimens –13.16, range 11 to 15); seventh sternite with carina arcuate to left (fig. 25).

Aedeagus: Anteapical membrane distinct, left lateral lobe (fig. 20) with 6 to 12 setae (in 12 Nearctic specimens over total range, average number 8.3, modal number 8).

Material Examined: EUROPE: SUISSE-GENEVE: Geneve, Florissant, Zeudon, 5 May 1962, C. Besuchet leg., 5 males, 6 females; FRANCE: *Gard*: Nimes, 9 Feb. 1953, J. Therond leg., 4 males, 4 females (all determined by C. Besuchet, JAWC). In addition I have examined 30 specimens collected by W. Sixl with the following unknown code data: H 300, D 8:1:1966, F Autal, B Espe (JAWC). NORTH AMERICA: CANADA: *Quebec*: Montreal, 29 June 1898, (OP). *Ontario*: ESSEX CO., Tilbury, 26 Mar., 1 male; 2 June, 2 males; 5 Sept., 3 males, 1 female all 1967, K. Stephan leg., sifting (JAWC). UNITED STATES: *New York*: Long Island, 1 male (ICCM). *Washington, D.C.*: 2 Sept. 1964, Suter, 1 male, 9 females, tulip tree TH (JAWC). *Pennsylvania*: WESTMORELAND CO., Latrobe, St. Vincent, 1 male, 5 females, maple TH (JAWC). *Ohio*: 1 male, (ICCM); HAMILTON CO., Cincinnati, 4 males (CMNH). *Michigan*: ALLEGAN CO., Saugatuck, 1 male (OP); BERRIEN CO., S. of Naomi, 3 Apr. 1961, Suter, 1 male, from moss (JAWC); MUSKEGON CO., Montague, Pigeon Hill, 13 Aug. 1962, Wagner, 2 males, oak TH, (JAWC). *Illinois*: COOK CO., Lake Street Woods, 1 Oct. 1952, J. Camin, 1 male (OP), Evanston, Aug. 1958, Suter, 3 males, 4 females, elm TH (JAWC), Skokie, Peebles Stable, Sept. 1960, Wagner and Suter, 2 males, 1 female; Mar. 1961, 21 males, 33 females; Apr. 1961, 9 males, 18 females, composted horse manure (JAWC); DUPAGE CO., Wayne, 28 Dec. 1952, J. Camin, 1 male, 1 female (OP); LAKE CO., Highland Park, 2 Apr. 1950, R. Crossman, 1 male, TH (OP), Rosecrans, 24

May 1960, Wagner, 1 male, 3 June 1960, Suter, 1 female, old sawdust (JAWC); MCLEAN CO., Bellflower, 21 Oct. 1933, Park, 2 males, 2 females (OP). *Iowa*: 11 males, 2 females, (ICCM), F. C. Fletcher collection, 2 males (OP), 2 males, (OSUC); JOHNSON CO., Iowa City, 2 males, 1 female, Fall collection (MCZC); LINN CO., Cedar Rapids (Type male and 4 paratypes of *iowensis* USNM). *Wisconsin*: ADAMS CO., Friendship, 16 June 1960, Suter, 1 male, 2 females, oak TH; 10 Apr. 1961, Wagner, 7 males, 9 females, old haystack (JAWC); WALWORTH CO., Pell Lake, 16 Sept. 1960, Suter, 4 males, 9 females, old corn cobs (JAWC); KENOSHA CO., Kenosha, 12 Nov. 1962, Suter, 1 male, 1 female, birch TH (JAWC); WASHINGTON CO., Colgate, 19 June 1950, R. Howard, 2 males, 1 female, hickory TH (OP). *Minnesota*: BECKER CO., Smoky Hills State Forest, Two Inlets, 20–21 June 1961, Wagner-Suter, 3 males, 26 females, old haystack (JAWC). The total number examined was 275 (105 males, 136 females, plus 34 unsexed).

HABITAT: Most frequently found in composted or well rotted haystacks, corncob piles, horse manure, and occasionally in tree holes.

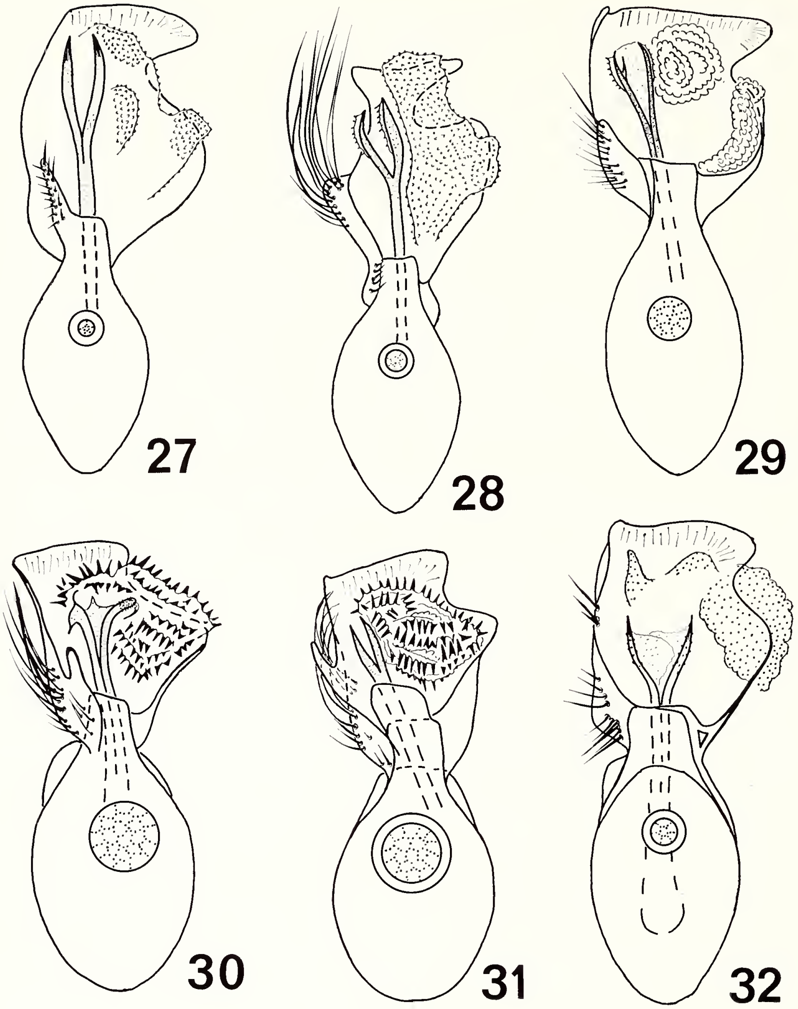
CALIFORNICUS GROUP

The male venter of the *californicus* group is relatively simple with the sixth sternite impressed medially and bearing papilliform sensilla (*californicus* has not been examined for these sensilla, but I assume that they are present); the aedeagi show group conformation. None of the species has been collected in tree holes, a common habitat of the *confluens* group, but log mold and under loose bark seem to be preferred habitats. Although the data are meager, I feel this group is associated with conifer forests, and several collections have come from high elevations. *E. signatus* is not considered part of this group, but is an introduced European species.

Euplectus californicus Casey

Euplectus californicus Casey, 1887, p. 476. Type locality: California, Placer Co., Lake Tahoe, under bark. Type male USNM no. 38622. Subsequent references: Brendel and Wickham, 1890, p. 70 (descript.). Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 28 (descript., key ref.). Park and Wagner, 1961, p. 17 (descript. key).

DISCUSSION: This high Sierra species is known only from the type series. The sixth sternite with rounded tubercles and carinoid margins of the impression are diagnostic. The type was not examined for



FIGS. 27–32. *californicus* group aedeagi. 27. *Euplectus californicus* Casey, aedeagus (.264 mm long). 28. *Euplectus acomanus* Casey, aedeagus (.228 mm long). 29. *Euplectus idahoensis* Park & Wagner, aedeagus. 30. *Euplectus duryi* Casey, aedeagus from Illinois male. 31. *E. duryi* Casey, aedeagus from Idaho male. 32. *Euplectus elongatus* Brendel, aedeagus.

sensilla on the sixth sternite. The aedeagus suggests that *californicus* is most closely related to *idahoensis.*

MEASUREMENTS OF TYPE MALE: Head .228 mm long × .334 mm wide, pronotum .281 mm long × .334 mm wide, elytra .457 mm long × .457 mm wide, abdomen .440 mm long × .422 mm wide, antenna .422 mm long × .088 mm wide, tergite ratio 1-1-1-1.8-1, sternite ratio 1-1-1-1-.2-1-1.2.

DESCRIPTION: Head transverse, rather large, surface coarsely, deeply, and rather densely punctate; pronotal disc with slightly elongate fovea near center, prosternum punctate as for head. Male venter: sternites 1 through 5 simple; sixth sternite with large and very deep impression sloped from apex to base evenly with deepest part at base, lateral margins evenly carinoid, lateral tubercles small, rounded; seventh sternite with carina arcuate to left (fig. 35).

Aedeagus: Similar in form to *elongatus* and *idahoensis* with anteapical membrane finely tuberculate, left lateral process with several very short setae (fig. 27).

MATERIAL EXAMINED: *California*: PLACER CO., Lake Tahoe, June 1887, Casey, 1 male Type, 2 females, paratypes, under bark (USNM).

Euplectus acomanus Casey

Euplectus acomanus Casey, 1908, p. 265. Type locality: Cloudcroft, Otero Co., New Mexico. Type male USNM no. 38624. Subsequent references: Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 29 (descript., key ref.). Park and Wagner, 1961, p. 17 (descript. key, fig.).

DISCUSSION: This infrequently collected species shows a disjunct range from New Mexico to Indiana to Maryland! It is most closely allied to *elongatus* by the male venter and aedeagus, and is separated by the anteapical constriction of ventral lobe, and long setae on the left lateral lobe of the aedeagus.

MEASUREMENTS OF TYPE MALE: Head .246 mm long × .352 mm wide, pronotum .299 mm long × .316 mm wide, elytra .440 mm long × .440 mm wide, abdomen .475 mm long × .415 mm wide, antenna .440 mm long × .088 mm wide, tergite ratio 1-1-1-1.8-1.2, sternite ratio 1-1-1-1-.5-.9-1.3, basal abdominal carinae maximum separation .09 mm.

DESCRIPTION: Head large, wider than pronotum, basally truncate, sides parallel, surface coarsely and densely punctate everywhere except in moderate frontal depression which connects with short, parallel sulci, ventral surface coarsely and densely punctate; pronotum sparsely punctulate, discal fovea large and elongate, prosternum coarsely punctate. Male venter: sternites 1 through 5 simple; sixth sternite with deep, glabrous rounded impression in median third, each side with row of six to seven papilliform sensilla from margin of impression obliquely toward side; seventh sternite impressed at base, carina arcuate to left (fig. 37).

Aedeagus: Ventral lobe with anteapical constriction, left lateral lobe with many long setae which extend beyond ventral lobe (fig. 28).

MATERIAL EXAMINED: *New Mexico*: OTERO CO., Cloudcroft, 6 June 1905, Warren Knaus, 1 male Type, 2 males, 2 females paratypes, at 9000 ft. (USNM), 2 males, 1 female–topotypes, probable paratypes, from F. C. Fletcher collection (OP), 2 males–topotypes, probable paratypes, in Fall collection (MCZC). *Indiana*: PORTER CO., Ogden Dunes, 26 Oct. 1946, L. Jones, 1 male, under bark pine log (OP). *Maryland*: BALTIMORE CO., Baltimore, 22 Mar., 1 male, under bark of white pine (OP). The total number examined was 12 (9 males, 3 females).

HABITAT: Under pine bark.

Euplectus idahoensis Park and Wagner

Euplectus idahoensis Park and Wagner, 1961, p. 17. Type locality: Idaho, Latah Co., Moscow Mountain. Holotype male CASC (on loan from University of Idaho?).

DISCUSSION: This species was described from a single male. It is most closely related to *elongatus* on the basis of male venter and aedeagus, and additional specimens could reveal *idahoensis* to be a western variety of *elongatus*.

MEASUREMENTS OF HOLOTYPE MALE: Head .264 mm long × .334 mm wide, pronotum .317 mm long × .352 mm wide, elytra .476 mm long × .520 mm wide, abdomen —— × .405 mm wide, antenna .475 mm long × .070 mm wide, tergite and sternite ratios as for genus, total length 1.4 mm.

DESCRIPTION: Head wider than long, vertex coarsely punctate lateral to foveae, front and ambient sulcus glabrous, ventral surface coarsely punctate; pronotal disk with deep oval foveoid impression over half discal length, prosternum less coarsely punctate than gula. Male venter: sternites 1 through 5 simple; sixth sternite deeply impressed for median half of width, narrower and deeper to base, lateral margins tuberculoid and elevated to apex with seven (right) or nine (left) papilliform sensilla in oblique row; seventh sternite with carina arcuate to left (fig. 36).

Aedeagus: Similar to *elongatus*, but distal phallic rami not microtuberculate; left lateral lobe with relatively short, laterally or apically directed setae (fig. 29).

MATERIAL EXAMINED: *Idaho*: LATAH CO., Moscow Mountain, 25 Apr. 1953, W. F. Barr, 1 male, Holotype, at 3000 ft. in *Salix* leaf litter (CASC).

Euplectus elongatus Brendel

Euplectus elongatus Brendel, 1893, p. 281. Type locality: Chestnut Ridge, Youngstown, Westmoreland Co., Pennsylvania. Lectotype male ANSP no. H9447. Subsequent references: Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 28 (descript., key ref.).

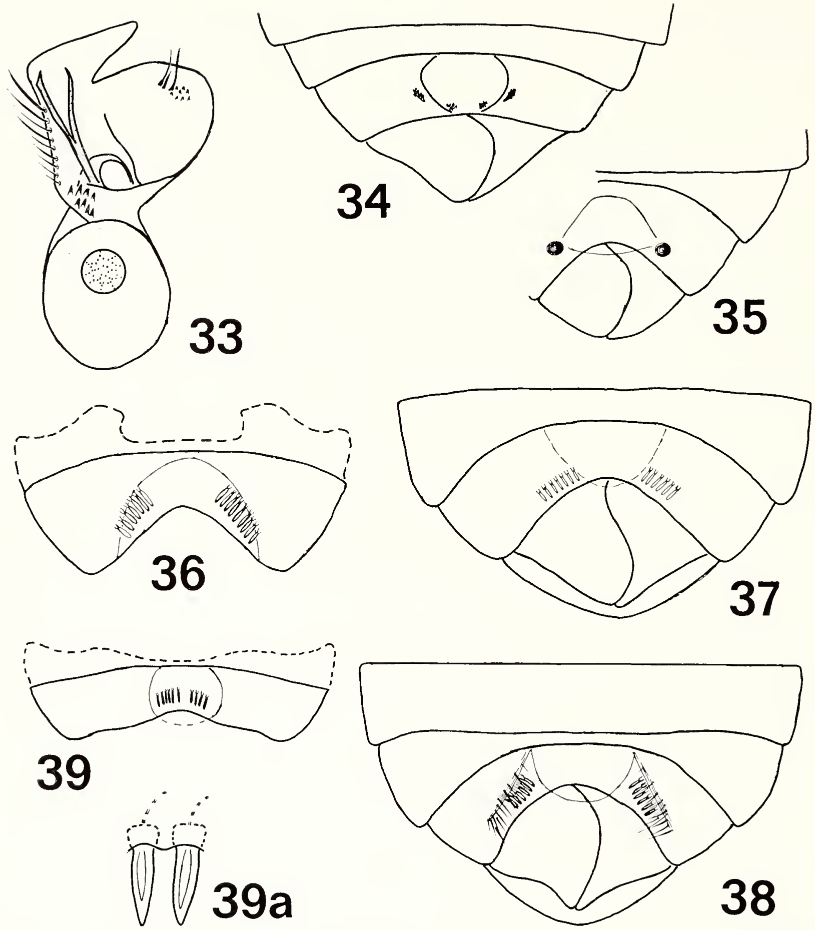
DISCUSSION: The lectotypic specimen in the Horn collection bears a label "Pen" with the top of the "e" filled in red. This is assumed to designate the type locality cited by Brendel. The lectotype was designated only by specimen label, October 27, 1948, O. Park, but was not published. I confirm this designation. *E. elongatus* is most closely related to *acomanus* and *idahoensis* on the basis of the male venter and aedeagus, but the distal rami of the phallus are microtuberculate, and the left lateral lobe bears several posteriorly directed setae.

MEASUREMENTS OF LECTOTYPE MALE: Head .246 mm long × .352 mm wide, pronotum .299 mm long × .352 mm wide, elytra .475 mm long × .475 mm wide, abdomen .528 mm long × .440 mm wide, antenna .475 mm long, tergite ratio 1-1-1-2-1, sternite ratio 1-1-1-1-.2-.8-1.5, basal abdominal carinae .088 mm at base, .12 mm maximum separation.

DESCRIPTION: Head transverse, tempora rounded, vertex and front subglabrous, foveae small, nude, surface punctate posterolateral of foveae as for *duryi*, ventral surface with medium punctations; pronotum discal fovea oval, prosternum sparsely punctate. Male venter: sternites 1 through 5 simple; sixth sternite with deep, ogival, glabrous depression in median third, from base of depression, each side, elongate, hirsute tumulus with five to seven papilliform sensilla in diagonal row (lectotype six right, five left; topotype five right, seven left); seventh sternite depressed at base, carina arcuate to left (fig. 38).

Aedeagus: Distal ramus of phallus strongly bifurcate, microtuberculate; left lateral lobe with short setae directed posteriorly, laterally, and apically, not recurved nor reaching apex (fig. 32).

MATERIAL EXAMINED: *Pennsylvania*: WESTMORELAND CO., Youngstown, Chestnut Ridge, Jerome Schmitt, 1 male lectotype, Horn collection (ANSP), 14 males, 5 females topotypes (probable paratypes, all bear "Pen" label as cited above) Ulke collection (ICCM); Latrobe, St. Vincent, 2 males, 2 females, Fall collection (MCZC). *Maryland*: MONTGOMERY CO., Cabin John, 7 June 1965, Suter, 1



FIGS. 33–39. Figs. 33–34. *Euplectus signatus* (Reichenbach). 33. Aedeagus. 34. Venter of male. Figs. 35–39. *californicus* group male venters. 35. *Euplectus californicus* Casey, sternites 5–7. 36. *Euplectus idahoensis* Park & Wagner, sternite 6. 37. *Euplectus acomanus* Casey, sternites 5–7. 38. *Euplectus elongatus* Brendel, sternites 4–7. 39. *Euplectus duryi* Casey, sternite 6. 39a. Detail of papilliform sensilla.

male, subcortical log with polypore (JAWC). *Illinois*: CHAMPAIGN CO., Urbana, Trelease Woods, 28 Apr. 1951, R. K. Benjamin, 1 male, leaf mold (INHS). The total number examined was 26 (19 males, 7 females).

HABITAT: Leaf litter and under bark of decaying log.

Euplectus duryi Casey

Euplectus duryi Casey, 1908, p. 266. Type locality: Cincinnati, Hamilton Co., Ohio. Type male USNM no. 38625. Subsequent references: Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 30 (descript., key ref.).

Euplectus barri Park and Wagner, 1961, p. 17. Type locality: Moscow, Latah Co., Idaho. Type male CASC (on loan from Univ. of Idaho?). **New synonym.**

DISCUSSION: *E. duryi* has been frequently found in southeastern and midwestern states, and recent collections show populations present from Maine to Idaho encompassing the greatest range for any species in the *californicus* group. There is some variation of characters across this range and *barri* falls well within the species. When *barri* was described, *duryi* had not been studied in detail, and unfortunately the three-quarter angle published drawing of *barri*'s aedeagus added confusion. I reexamined the *barri* Type and established its synonymy both on male venter and aedeagal form.

MEASUREMENT OF TYPE MALE: Head .246 mm long × .340 mm wide, pronotum .281 mm long × .340 mm wide, elytra .440 mm long × .440 mm wide, abdomen .475 mm long × .412 mm wide, antenna .40 mm long, tergite ratio 1-1-1-2-1, sternite ratio 1-1-1-1-.5-1-1.2, basal abdominal carinae separation .123 mm apical, .088 mm basal.

DESCRIPTION: Head transverse, vertex impunctate glabrous, tempora lateral to small nude vertexal foveae, coarsely but not closely punctate, ventral surface glabrous in median fourth to sixth; prosternum shining, sparsely punctulate. Male venter: sternites 1 through 5 simple; sixth sternite with small, deep impression in median fourth bearing anteapical transverse row of six to 12 small, papilliform sensilla (in nine specimens over total range, average 9.4, range 6 to 11; Maine specimen –6 with slight separation at center, Illinois –11, Colorado –10 with no separation, Idaho –11 with slight separation); seventh sternite carina arcuate to left (fig. 39).

Aedeagus: Left lateral lobe with thumblike projection and numerous long setae, anteapical membrane bearing numerous long spikes or spines (fig. 30—Illinois, 31—Idaho).

MATERIAL EXAMINED: *Ohio*: HAMILTON CO., Cincinnati, Charles Dury, 1 male Type (USNM), 3 males, 2 females (CMNH), 1 male, Fall collection (MCZC). *Maine*: HANCOCK CO., W. Gouldsboro, 21 Oct. 1967, S. Peck, 1 male, spruce duff (FMNH). *Washington, D.C.*: 1 male (ICCM). *Maryland*: MONTGOMERY CO., Takoma Park, 16 Oct. 1951, D. G. Kissinger, 1 male, log mold (JAWC); CARROL CO., nr. Marriottsville, 26 July 1959, Wagner and Suter, 1 male, log mold

(JAWC). *Pennsylvania*: 1 male Fall collection (MCZC); PHILADELPHIA CO., N. Philadelphia, 1 male (OSUC); CHESTER CO., West Chester, 1 male, 1 female (OSUC); New London, 2 Oct. 1954, R. S. Howard, 1 male (OP); WESTMORELAND CO., Latrobe, St. Vincent, 4 males (OSUC), J. Schmitt and/or C. A. Schaffer?, 18 Apr. 1895, 2 males; 29 May 1895, 1 male; 1 May 1895, 1 male; 17 Sept. 1896, 1 female (OP); 16 May 1896, J. Schmitt, 1 male; 3 June 1896, J. Schmitt, 1 male, Schmitt collection (FMNH). *Tennessee*: 1 male, 5 females (ICCM); PICKETT CO., Pickett State Park, Steeves, 1 male, log mold (HS). *North Carolina*: JACKSON CO., Balsam, 1 male (OSUC). *Georgia*: FLOYD CO., Coosa, 1 male (CMNH). *Illinois*: OGLE CO., 5 mi. S. of Oregon, Castle Rock Ravine, 8 Nov. 1958, Suter, 1 male, log mold (INHS); VERMILION CO., Oakwood, 27 Mar. 1934, 1 male (OP); WILL CO., 1 mi. N. of Frankfort, Hickory Creek, 31 Aug. 1952, H. S. Dybas, 1 male (OP). *Wisconsin*: ADAMS CO., Friendship, Parklan, 7 Apr. 1960, Wagner, 1 male, pine duff nr. log (JAWC). *Iowa*: JOHNSON CO., Iowa City, 21 June, H. F. Wickham, 4 males, 4 females, F. Psota collection (FMNH). *Colorado*: LARIMER CO., Pingree Park (CSU Forestry Station) at Fall Creek, July–Aug. 1965, Wagner, 1 male, 6 females, 9520 ft. in old sawdust under bark of slash (JAWC). *Idaho*: BEAR LAKE CO., 11 mi. NW of Ovid, 4 Aug. 1959, C. C. Hoff, 1 male, 1 female, 7200 ft. in woody debris from rotten fir (?) stump; FRANKLIN CO., 16 mi. W of Ovid, 4 Aug. 1959, Hoff, 1 male, 6800 ft., debris from aspen logs and stump (JAWC); LATAH CO., Moscow, base of Moscow Mountain, 5 May 1949, W. F. Barr, 1 male (CASC, Holotype of *barri*). The total number of specimens examined was 60 (40 males, 20 females).

HABITAT: Most records are from log mold; sawdust and litter in spruce and fir forests have provided a few specimens.

Euplectus (Diplectellus) signatus (Reichenbach)

Euplectus signatus (Reichenbach), 1816, p. 73. Type locality: Central Europe. Subsequent references: Raffray, 1910, p. 210 (descript., distr. data); 1911, p. 31 (cat. citation). Jeannel, 1950, p. 114 (descript., key ref., distr. data, figs.). Pearce, 1957, p. 16 (key ref., distr. data). Karaman, 1962, p. 164 (descript., distr. data, figs.). Besuchet, 1974, p. 320 (descriptive key, distr. data, figs.).

DISCUSSION: This species is evidently introduced from Europe and is the third record of Holarctic distribution within the family. It is widely distributed in Europe, "All of France, common in leaf mold and plant debris. Distributed in Europe to the Caucases, Great Britain, but not in Ireland" (Jeannel, 1950) but, thus far is restricted to domestic and farm compost in the eastern part of North America. It has been collected with *karsteni* from manure compost in Illinois.

MEASUREMENTS OF MALE FROM CENTRAL WISCONSIN: Head .228 mm long × .299 mm wide, pronotum .281 mm long × .299 mm wide, elytra .404 mm long × .422 mm wide, abdomen .563 mm long × .404 mm wide, antenna .390 mm long, tergite ratio 1-1-1-1.2-1.5, sternite ratio 1-1-1-1-.4-.8-1, basal abdominal carinae maximum separation .140 mm.

DESCRIPTION: Head relatively small, sparsely punctulate, vertex convex, foveae small nude, U-shaped sulcus sloping in front, ventral surface of head and pronotum moderately punctate, metasternum with shallow median sulcus, pronotum convex with small elongate discal fovea, elytron with four antebasal foveae in two depressions. Male venter: sternites 1 through 4 simple; fifth sternite slightly medially depressed; sixth sternite with deep rounded glabrous depression in middle third which contains two to three anteapical papilliform sensilla each side, each posterior angle tumid with short setae and three to five contiguous papilliform sensilla; seventh sternite convex, with carina arcuate to left (fig. 34).

Aedeagus: Ventral lobe broadly and deeply incised on right; phallic rami long, diverging near middle (fig. 33).

MATERIAL EXAMINED: EUROPE: POLAND: Kelecsenyi, Settin, 2 males, Psota collection (FMNH). FRANCE: *Indre-Et-Loire*: La Haye, 1 male, 1 female, identified by R. Jeannel (OP). NORTH AMERICA: CANADA: *Quebec*: Laurentide Park, Camp Le Relais, 29 Aug. 1956, 3000 ft., H. S. Dybas, 2 males, wood shavings and straw compost nr. domestic rabbit hutch (FMNH). *Ontario*: ESSEX CO., Tilbury, 2 June 1967, 3 males; 15 Aug. 1967, 2 females, K. Stephan, manure (JAWC). UNITED STATES: *Vermont*: WASHINGTON CO., Barre, 7 July 1961, Wagner and Suter, 7 males, 3 females, cow manure mixed with sawdust (JAWC). *Illinois*: COOK CO., Skokie, Peebles Stable, Suter, Wagner, Reichle, W. Blinn, 21 Apr. 1960, 1 male, 1 female; 26 Apr. 1960, 2 males, 1 female; 17 May 1960, 11 males, 5 females; 31 Mar. 1961, 2 females; 20 July 1964, Wagner, 15 males, 10 females; 8 Aug. 1964, Wagner, 11 males, 10 females, all in mixed wood chips-horse manure at composted edge of mound (JAWC); DUPAGE CO., Wayne, 28 Dec. 1952, J. Camin, 3 males, 1 female (OP). *Wisconsin*: ADAMS CO., Friendship, Parklan, 3 Nov. 1961, Suter, 5 males, 5 females; 10 Apr. 1961, Suter and Wagner, 3 males, 3 females, domestic compost (JAWC, OP). The total number examined was 110 (66 males, 44 females, an unusually high ratio of 1.5 males to 1 female).

HABITAT: Thus far restricted to rich domestic or farm compost especially that with much fungal mycelia and also yielding Ptiliidae, and manure worms. Pearce reports *signatus* from the nests of *F. rufa* in Britain.

Genus **Pycnoplectus** Casey

Pycnoplectus Casey, 1897, p. 552. Type species, *Pycnoplectus linearis* (LeConte), 1850, p. 104, **new designation.** Casey, 1908, p. 264 (descript. note, new species descript.).

Euplectus (*Pycnoplectus*): Raffray, 1903–04, p. 84; 1908, p. 84; 1911, p. 29 (cat. citations). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 25 (descript.). Park, 1942, p. 26 (descript. note). Blackwelder, 1944, p. 90 (cat. citation). Arnett, 1961, p. 321 (cat. citation). Besuchet, 1974, p. 317.

DISCUSSION: In 1893 Casey indicated a subgroup I of North American *Euplectus* and included *difficilis*, *congener*, *sexualis*, *spinifer*, *linearis*, *hudsonicus*, *interruptus*, "and probably" *longissimus*. In 1897 he named this group as a new genus, *Pycnoplectus*, and described two new species, *tenellus*, and *imperfectus*, but he did not designate a type species. *P. tenellus* is a synonym of *congener*, and *imperfectus* is represented by a female type lacking good specific characters, and a *nomen dubium*. I now designate as type species, *Pycnoplectus linearis* (LeConte), 1850. This species clearly exemplifies the characteristics of the genus, which is distinguished by large pubescent vertexal foveae, lack of anterior prosternal foveae (a condition which Park, 1942, p. 25, considers advanced), and males with greatly modified intersegmental membranes between the fourth and fifth sternites, as well as a heavily sclerotized accessory phallus in the aedeagus. The robust form separates the genus to a familiar eye, and it should be included in modern pselaphid taxa.

DESCRIPTION: Body form robust, less parallel and not as depressed as *Euplectus*. Size from 1.3 mm to 2.0 mm in large species such as *P. parki*. Color pale yellow to red-brown.

Head: Trapezoidal, vertex convex with two large pubescent foveae which join frontal impression by sulci, which usually assumes shape of V or Y with short stem nearly crossing frontal roll at center; eyes prominent. Ventral surface with short, subappressed anteriorly directed setae. Mandibles with spinoid seta on external face (reduced in females) (figs. 6–7); labrum variable, concave in *linearis*, medially pointed in *congener*. Antennae as described for *Euplectus* (fig. 12).

Thorax: Pronotal disk with longitudinal impression, antebasal lateral foveae deep, pubescent, joined to glabrous median depression by arcuate sulci; lateral prosternal foveae pubescent, near coxa, anterior prosternal foveae (APF) absent. Elytra as described for *Euplectus*.

Legs: Presence or lack of metatrochantal process divides genus into two groups; mesocoxae, or metatrochanters may bear short spines; femur inflated in males; protibia of *P. cediosus* with exceptionally stout spine (fig. 41a); tarsi three segmented with single claw.

Abdomen: Stout, narrower than elytra, five visible tergites and one hypotergite covered by elytra, presumed stridulatory apparatus present (fig. 15); first and second tergites with basal carinae usually quite strong, foveate at base with medial basal depression densely pubescent; six sternites in females, seven in males, sternites four to six of males modified: Median basal fossa in fifth adjacent to projection from fourth-fifth intersegmental membrane, membrane usually with additional lateral spines or tubercles; sixth sternite usually with medial impression but lacking prominent papilliform sensilla; seventh sternite convex with "carina" arcuate to right.

Aedeagus: Apical process trilobed, (genus may be divided into two groups by form of ventral lobe), ventral lobe spatulate (figs. 59–62), or upturned strongly clubbed, some with spine (figs. 45–49); phallus similar to *Euplectus*, but with accessory phallus heavily sclerotized and usually bifid (figs. 16–17). Schuster and Grigarick (1962, p. 1) report a low frequency of exact mirror images in aedeagi of western *Rhexidius* Casey of the same species. I can report one occurrence of mirror image reversal for *Pycnoplectus difficilis* (LeConte).

KEY TO THE SPECIES OF PYCNOPLECTUS MALES OF UNITED STATES AND CANADA

1. Metatrochanter with small laminoid process on ventral face; ventral aedeagal lobe spatulate .... *congener* group 8
   Metatrochanter smooth or carinate, but never with blunt, laminoid process; ventral aedeagal lobe clubbed 2
2. Posterior margin of fourth sternite or fourth-fifth intersegmental membrane with lateral tubercles, not spinoid, but rounded, large or minute, or if abdominal sternites strongly contracted, tubercles may be hidden beneath fourth sternite .... *linearis* group 3
   Posterior margin of fourth sternite with lateral spines or spinoid tubercles .... *sexualis* group 6
3. Protibia with strong stout spine on external face, about two-fifths of tibial length from base (fig. 41a); aedeagus as illustrated (fig. 48) .... *cediosus*, new species
   Protibia simple, not spined; aedeagus not as illustrated 4
4. Posterior margin of fifth sternite fossa medially deeply and sharply

divided by triangular notch, separating margin into two oblique, transverse, laminoid tubercles (fig. 44); aedeagus with ventral lobe produced into strong, flat arcuate process (fig. 49) .... *parki*, new species

Posterior margin of fifth sternite fossa arcuate or trisinuate; ventral aedeagal lobe otherwise 5

5. Posterior margin of fifth sternite fossa with median pyramidal, truncate tumulus (fig. 40); ventral lobe of aedeagus with short dextral spine (figs. 45 and 46) .... *linearis* (LeConte)

Posterior margin of fifth sternite fossa with single arcuation (if segments strongly contracted) or trisinuate, never with pyramidal tumulus (figs. 42 and 43); ventral aedeagal lobe never spined (fig. 47) .... *interruptus* (LeConte)

6. Lateral spines from margin of fourth sternite completely sclerotized, long, extending across fifth sternite (figs. 50 and 52) .. 7

Lateral spines part of fourth-fifth intersternal membrane, broad and tubercular at base; mesad to spines an opaque, white membranous lobe (fig. 54); aedeagus as illustrated (fig. 55) .... *infossus* (Raffray)

7. Body length 1.2 to 1.4 mm; fourth sternite spine sulcate, curving inward slightly at tips, not branched nor twisted (fig. 52); aedeagal accessory phallus bifid with right ramus recurved, left ramus lanceolate (fig. 53) .... *spinifer* (Casey)

Body length 1.6 mm; fourth sternite spine variable: Laminate and twisted to end and/or with small black acute thumblike spine (fig. 50); aedeagal accessory phallus bifid with right ramus lanceolate, left ramus curved resembling birds head (fig. 51) .... *sexualis* (Casey)

8. Mesocoxae and mesotrochanters lacking mesoventral spine; fossa at base of fifth sternite in median third with sharply arcuate, suborbicular, upturned apical margin (fig. 57); aedeagal accessory phallus bifid, both rami strong and straight, mesial ramus slightly longer (fig. 61) .... *longipennis* (Casey)

Mesocoxae or mesotrochanters with small, but distinct ventral spine, fifth sternite and aedeagus not as described 9

9. Mesocoxae spined; mesotrochanters not spined; fossa of fifth sternite with trisinuate apical margin (fig. 56); aedeagus with accessory phallus simple, not bifid (fig. 59) .... *congener* (Casey)

Mesocoxae not spined; mesotrochanters with small ventral spine; aedeagus with accessory phallus bifid 10

10. Fossa of fifth sternite with sinuate posterior margin (fig. 56 as in *congener*); accessory phallus with left ramus broadly arcuate, sickle shaped (fig. 60) .... *falcatus*, new species

Fossa of fifth sternite with straight apical margin for median half of width (fig. 58); accessory phallus with short thumblike lateral process (fig. 62) .... *difficilis* (LeConte)

LINEARIS GROUP

The four species in this group may be distinguished by the following combination of characteristics in males: 1) legs without spines or laminae on coxae and trochanters, 2) fourth-fifth sternite intersegmental membrane with lateral tubercles, but not spines nor tubercles produced to spines, 3) ventral lobe of aedeagus strongly upturned and clubbed, and bifid in all species except *interruptus*.

Pycnoplectus linearis (LeConte), new combination

Euplectus linearis LeConte, 1850, p. 104. Type locality: Louisiana, Type male MCZC no. 6188. Subsequent references: Casey, 1884, p. 106. Brendel and Wickham, 1890, p. 68 (descript., fig. 107, distr. data). Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 32 (descript., key ref.).

Euplectus impressiceps Casey, 1908, p. 265. Type locality: Westmoreland Co., Pennsylvania, Type deposition unknown. Subsequent references: Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 34 (descript., key ref.). **New synonym.**

Discussion: This has been the most frequently collected species of the genus in the southeast. LeConte's description of *linearis* is based on head, pronotal, and other generic features with no mention of male venter characteristics. Although the type of *impressiceps* could not be located in any of the major collections I examined, Casey's description of the male venter is identical to the Type of *linearis* at the Museum of Comparative Zoology. I have collected numerous specimens of *linearis* in Westmoreland County, Pennsylvania which agree completely with the description of *impressiceps*, and it is undoubtedly a synonym of *linearis*.

Measurements of Type Male: Head .264 mm long × .369 mm wide, pronotum .330 mm long × .389 mm wide, elytra .475 mm long × .492 mm wide, abdomen .528 mm long × .475 mm wide, antenna .528 mm long, tergite ratio 1-1-1-2-1, sternite ratio 1-1-1-.9-.6-.8-1.5, basal abdominal carinae maximum separation .140 mm.

Description: Body pubescence short, aciculate, evenly spaced; longer guard setae along margins; color even red-brown.

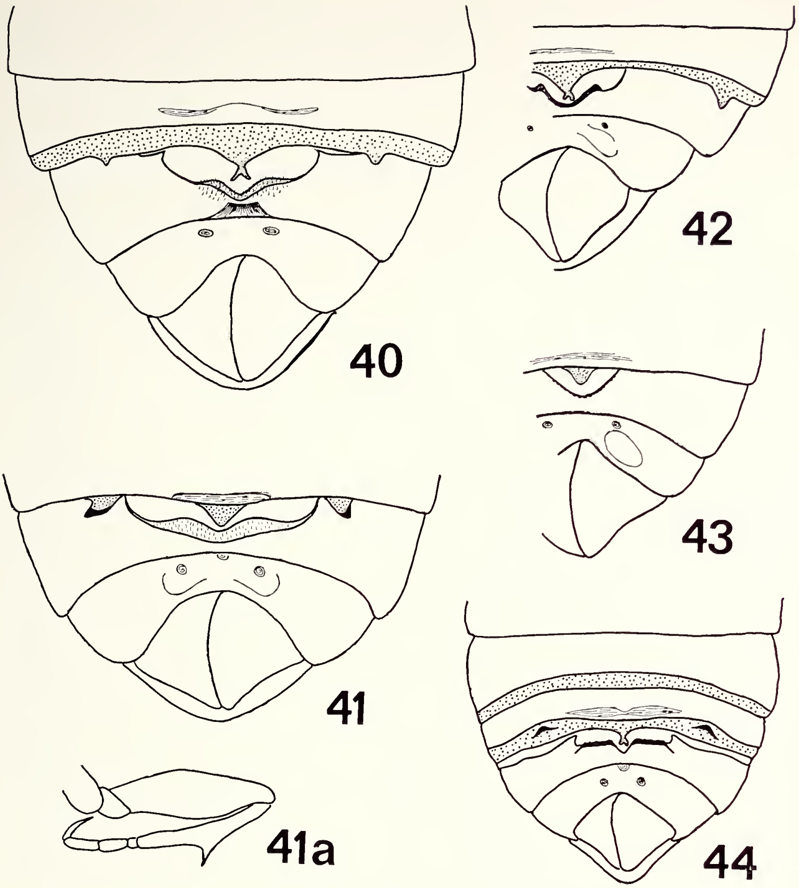
Head: Trapezoidal, surface finely and sparsely punctulate; vertex convex with two pubescent foveae on line through base of eyes; frontal sulcus in form of rounded Y, stem barely crossing frontal margin at center, and arms arcing to foveae; eyes large, with about 40 facets; first segment of antenna cylindrical, as long as 2 and 3 combined, 9 transverse, as long as 8, 10 twice as large as 9, 11 wider than 10 as long as 8 through 10 combined, with two sensory excavations; gula convex, lightly punctate with several forward directed aciculate setae; mandibles with stout spinoid seta on each external angle.

Thorax: Pronotum cordiform, widest just before middle, discal sulcus elongate, feebly connected with antebasal sulcus which connects strongly with lateral pubescent foveae; prosternum convex, not carinate, sparsely punctulate, anterior prosternal foveae (APF) obsolete, indicated only by tiny impressions, lateral prosternal foveae (LPF) large and densely pubescent; metasternum longitudinally sulcate; elytra broadest part of body, elytron with four antebasal foveae and pubescent subhumeral fovea; sutural stria and subhumeral stria entire, discal stria feeble in first half of length; legs simple, mesotrochanters carinoid.

Abdomen: First two tergites with nearly entire, slightly divergent basal carinae; area between carinae basally pubescent. Male venter: Sternites 1 through 3 simple; fourth sternite transversely tumuloid (in some carinate), tumulus usually medially depressed; intersegmental membrane between fourth and fifth with median triangular tubercle, and small tubercles in each lateral third; fifth sternite with deep fossa in basal median third which contains median tubercle of fourth, posterior margin of fossa upturned, carinoid, and sinuate; fifth sternite with truncate pyramidal tumor in apical center which joins margin of fossa; sixth sternite impressed medially with two small rounded tumuli separated by one-fifth segmental width; seventh sternite convex, carina arcuate to right (fig. 40).

Aedeagus: With simple lanceolate accessory phallus; ventral lobe upturned and clubbed, with lanceolate spine projecting from distal right side and paralleling main branch (in some quite reduced or three-fourths as long as clubbed ramus) (figs. 45, 46).

MATERIAL EXAMINED: CANADA: *Ontario*: ESSEX CO., Tilbury, 5 Sept. 1967, K. Stephan, 2 males, 1 female, sifting (JAWC). UNITED STATES: *Louisiana*: Type male 1, 1 male, 2 females paratypes, collected by Schaum (type labeled with a red-brown tag which was LeConte's key for the Gulf States), LeConte collection (MCZC). *New York*: NIAGARA CO., Olcott, 15 Aug. 1922, H. Dietrich, 1 male (OP). *New Jersey*: GLOUCESTER CO., Woodbury, 1 male (OSUC). *Pennsylvania*: 19 Aug. 1896, 1 male, C. A. Schaeffer collection (OP); BERKS CO., Highs Hill, 14 Aug. 1951, D. G. Kissinger, 1 male (OP), Mt. Penn, 7 July 1951, 1 male, under bark (OP); PHILADELPHIA CO., 1 male, 3 females; Frankfort, 1 male, 3 females (OSUC); WESTMORELAND CO., Rector, Linn Run, 24 July 1959, Wagner and Suter, 1 male, log mold (JAWC), Seward, 24 and 28 July 1959, Wagner and Suter, 9 males, 4 females; 13 males, 12 females; 5 males, 5 females, all in sawdust and under boards in sawdust (JAWC), Latrobe, St. Vincent,



Figs. 40–44. *linearis* group of *Pycnoplectus*, male venters. 40. *Pycnoplectus linearis* (LeConte), sternites 4–7. 41. *Pycnoplectus cediosus*, new species, sternites 4–7. 41a. Right proleg. 42. *Pycnoplectus interruptus* (LeConte), sternites 4–7 expanded. 43. *P. interruptus* (LeConte), sternites 4–7 contracted. 44. *Pycnoplectus parki*, new species, sternites 3–7.

28 July 1959, Wagner, 1 male, 2 females, beech TH, 1 male, under bark (JAWC), 1 male, 2 females, Fall collection (MCZC). *Maryland*: BALTIMORE CO., Baltimore, 26 July 1959, Suter, 2 males, 2 females, sawdust in oak tree crotch (JAWC); HOWARD CO., Woodstock, 26 July 1959, Wagner and Suter, 3 males, 2 females, under boards in sawdust, 5 males, 4 females, sawdust (JAWC); MONTGOMERY CO.,

Glen Echo, 6 June 1964, Suter, 1 male, under bark (JAWC). *Washington, D.C.*: 2 female "paratypes" (MCZC), United States National Arboretum, 27 July 1959, Wagner and Suter, 1 male, under bark (JAWC). *Georgia*: FULTON CO., Atlanta, 3 Apr. 1934, S. T. Park, 1 male (OP); GLYNN CO., Jekyll Island, 28 May 1959, S. Auerbach, 1 male, 2 females, log mold (JAWC); TERRELL CO., Dawson, 18 June 1959, Suter, 1 male, live oak TCH (OP). *Florida*: 1 male, (ICCM); VOLUSIA CO., Enterprise, 2 mi. SW, 31 July 1965, Suter, 9 males, 2 females, oak log mold with 1 male *P. spinifer* (JAWC). *Kentucky*: POWELL CO., nr. Sky Bridge Valley of Red River, 12 June 1947, E. Williams, 1 male (OP). *Ohio*: Psota collection ex. Wickham collection, 1 male (FMNH); HAMILTON CO., Cincinnati, 1 male, 1 female, Fall collection (MCZC), 30 Apr. 1902, 1 male (OP). *Indiana*: MONTGOMERY CO., Waveland, Shades State Park, 7 Sept. 1950, Park, 2 males (OP); PORTER CO., Ogden Dunes, 26 Oct. 1946, Park, 1 male, floor litter (OP). *Illinois*: 1 male, Bolter collection (INHS); CHAMPAIGN CO., Urbana, Trelease Woods, 1 male, TH; 1 male, 3 females, under bark; Brownfield Woods, 1 male, rotten polypore fungus; 1 male, leaf mold (INHS), 3.5 mi. NE Mahomet, Hart Memorial Woods, M. W. Sanderson, 1966, 16 Apr., 1 female, under bark; 15 May, 1 male, under bark; 30 May, 1 male, 3 females, under bark oak log; 30–31 May, 2 males, black light trap; 3–4 June, 5 females, under bark oak log; 17–18 June, 1 male, black light (JAWC); JACKSON CO., Makanda, 1 male, 1 female, log mold (INHS); LASALLE CO., Starved Rock State Park, 2 males, log mold (OP); MASON CO., Havana, 1 male, log mold (INHS); PIATT CO., White Heath, 1 male, log mold (INHS); UNION CO., Wolf Lake, Pine Hills Ecological Area, 29 Aug. 1959, Wagner and Suter, 3 males, 1 female, beech TH (JAWC); VERMILION CO., Danville, 2 males, 1 female, stump mold (INHS); WILL CO., Monee, Raccoon Grove, 18 Dec. 1959, Suter, 2 males, 4 females, maple TH, 6 May 1961, Suter and Reichle, 1 male oak BTH (JAWC). *Michigan*: BERRIEN CO., Lakeside, Warren Woods, 7 May 1949, Park, 1 male, 18 Apr. 1942, J. B. Calhoun, 1 female, 8 Nov. 1952, S. Auerbach, 1 male, (OP). *Oklahoma*: CLEVELAND CO., Norman, Oliver Woods, 10 July 1968, Suter, 1 male, dead oak buttress debris, 30 June 1965, Suter, 1 female, stump buttress debris (JAWC). *Texas*: COLORADO CO., Columbus, 23 July 1968, Suter, 1 male, 1 female, under bark cottonwood (JAWC). The total number examined was 173 (102 males, 71 females).

HABITAT: *Pycnoplectus linearis* has been collected with equal frequency in log mold and from under bark; sawdust and tree holes have yielded some good series; the four collections at black light from

Hart Woods are from a trapping program run for an entire year, this is the only record of collection at light for the genus.

Pycnoplectus interruptus (LeConte), new combination

Euplectus interruptus LeConte, 1850, p. 105. Type locality: Athens, Clarke Co., Georgia, Type male MCZC no. 6190. Subsequent references: Casey, 1884, p. 107. Brendel and Wickham, 1890, p. 64 (descript., key ref., fig. 108). Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 33 (descript., key ref.).

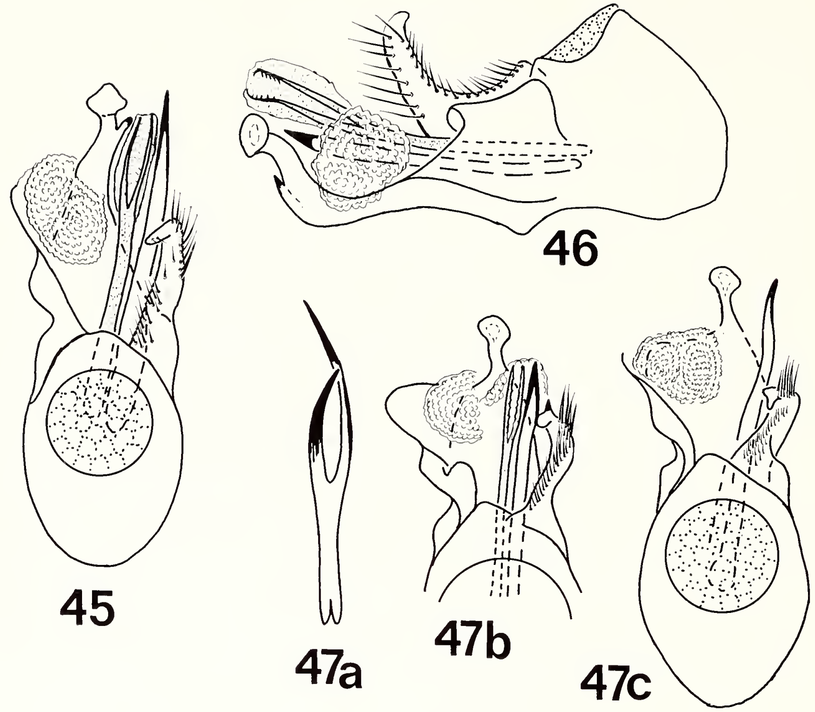
Euplectus hudsonicus Casey, 1893, p. 455. Type locality: Brooklyn, Kings Co., New York, Type male USNM no. 38617. Subsequent references: Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 32 (descript., key ref.). Park et al., 1950, p. 39 (ecology). **New synonym.**

Discussion: This species is complex and its discrimination is not wholly satisfactory. Sufficient material is not now available for detailed analysis. If the abdomen has contracted due to shrinkage in drying, the description of the male venter may not apply. Instead, the fourth-fifth intersegmental membrane may be entirely withdrawn so that the tubercles do not show. The fossa of the fifth sternite may appear quite small, with a simple, flat arcuate margin (fig. 43). The type male of *hudsonicus* has the abdomen strongly contracted so that the fourth-fifth membrane is completely withdrawn. It is understandable that Casey might describe this species as distinct, but on close comparison with *interruptus* it is conspecific.

Measurements of Type Male: Head .264 mm long × .369 mm wide, pronotum .334 mm long × .422 mm wide, elytra .510 mm long × .528 mm wide, abdomen .492 mm long × .528 mm wide, antenna .422 mm long, tergite ratio 1-1-1-2-1, sternite ratio 1-1-1-1-.3-.4-1.4, basal abdominal carinae maximum separation .140 mm.

Description: Preceding description for *linearis* applies to *interruptus* except for characters noted here: Body less robust, features generally more subdued. Male venter: Fourth sternite transversely tumid in median fourth (tumulus obsolete in some populations, nearly carinoid in others); membrane between fourth and fifth sternites with median triangular tubercle, as in *linearis*, but lateral tubercles more widely separated, in lateral fourth of width; fifth sternite with median basal fossa with trilobate, flat posterior margin; sixth sternite with deep, subreniform impression and two small basal tumuli (fig. 42 expanded, fig. 43 contracted).

Aedeagus: Ventral lobe upturned and clubbed, but always simple without trace of spine or any branching; accessory phallus bifid, rami



FIGS. 45–47. Figs. 45–46. *Pycnoplectus linearis* (LeConte), aedeagus. 45. Dorsal (.246 mm long). 46. Left lateral. 47. *Pycnoplectus interruptus* (LeConte), aedeagus. 47a. Accessory phallus. 47b–c. Variations in right lateral lobe.

long and slightly curved (fig. 47a); right lateral lobe in some with small terminal process (fig. 47b).

MATERIAL EXAMINED: CANADA: *Ontario*: ESSEX CO., Wheatley, 10 June 1967, K. Stephan, 1 male, sifting (JAWC). UNITED STATES: *Georgia*: CLARKE CO., Athens, Type male 1 (MCZC). *Alabama*: BLOUNT CO., Cleveland, 7 mi. S., 28 June 1967, Peck and Fiske, 1 male, stump and log litter (JAWC). *New York*: KINGS CO., Brooklyn, H. H. Smith, 1 male, Type of *Euplectus hudsonicus* (USNM no. 38617). *Washington, D.C.*: 3 males (ICCM). *Pennsylvania*: WESTMORELAND CO., Rector, Linn Run, 24 July 1959, Wagner and Suter, 1 male, 1 female, log mold (JAWC). *Michigan*: BERRIEN CO., Lakeside, 30 July 1949, S. Auerbach, 4 males (OP); LIVINGSTON CO., E. S. George Reserve, 4 May 1960, Suter, 1 male, oak TH, 2 males, stump hole (OP). *Ohio*: HAMILTON CO., Cincinnati, 7 males (CMNH).

Indiana: LAPORTE CO., Smith, 18 Aug. 1934, O. Park, 1 male (OP). *Illinois*: CHAMPAIGN CO., Urbana, 14 Apr. 1934, O. Park, 2 males, 1 female (OP); Brownfield Woods, 1 male, log mold (INHS); COOK CO., Orland Park, 2 Apr. 1959, Suter, 1 male, 1 female, oak TH (JAWC), Palos Park, Maple Lake, 23 Apr. 1960, Wagner, 1 male, oak TH (JAWC), Des Plaines, Carle Woods, 1 June 1960, Suter, 1 male, linden TH (JAWC); SANGAMON CO., Sherman, 1 male (INHS); WILL CO., Monee, Raccoon Grove, 18 Dec. 1959, Suter, 3 males, 4 females, maple TH (OP). *Wisconsin*: MONROE CO., Camp McCoy, 12 July 1959, Suter, 1 male (JAWC). *Minnesota*: CROW WING CO., Pequot Lakes, 2 males (OP). *Iowa*: STORY CO., Ames, 8 Nov. 1964, W. Craig, 1 male (JAWC). The total number examined was 44 (37 males, 7 females).

HABITAT: Tree holes have yielded a few more specimens than log mold.

Pycnoplectus cediosus, new species

Type locality: Cincinnati, Hamilton Co., Ohio. Holotype male Charles Dury collection CMNH.

DISCUSSION: This species is represented by the holotype male from Ohio, originally labeled "near *linearis*," and a second male collected 55 years later by Walter Suter in Kentucky. Indeed, the most remarkable departure from *linearis* is the spine of the protibia, which easily separates it from other species in the genus.

MEASUREMENTS OF HOLOTYPE MALE: Head .235 mm long × .365 mm wide, pronotum .316 mm long × .404 mm wide, elytra .475 mm long × .528 mm wide, abdomen .528 mm long × .490 mm wide, antenna .651 mm long, basal abdominal carinae maximum separation: First—.158 mm, second—.140 mm, total length 1.5 mm.

DESCRIPTION: Body rather stout, uniform red-brown, antennae and legs similar; pubescence moderate in length and number, some longer guard setae.

Head: Trapezoidal, widest through eyes; two pubescent vertexal foveae on line through posterior third of eyes; strong, glabrous U-shaped sulcus connecting foveae; vertex between foveae convex, impunctate; antennae long, first segment as long as 9 and 10 united; mouthparts as described in *linearis*.

Thorax: Pronotum widest just before middle, discal sulcus strong, elongate to antebasal impression which joins lateral pubescent foveae by sulci; margins slightly crenate in basal third; anterior prosternal foveae obsolete, lateral prosternal foveae pubescent; prolegs unique: Protibia with strong acute spine on external face two-fifths tibial length from base (fig. 41a); other legs simple. Elytra as described in *linearis*.

Abdomen: Tergites as described in *linearis*. Male venter: Fourth sternite tumid in median third; fourth-fifth intersegmental membrane with tubercle in each lateral third, median tubercle extending into fossa of fifth; fifth sternite fossa in basal third with complex triarcuate margin, just posterior to margin a parallel secondary margin; sixth sternite with three small median tumuli in shallow depression; seventh sternite with carina arcuate to right (fig. 41).

Aedeagus: Ventral lobe bifid, left ramus upturned and clubbed, right ramus lanceolate and curved; accessory phallus simple and bifid (fig. 48).

MATERIAL EXAMINED: *Ohio*: HAMILTON CO., Cincinnati, 15 May 1906, 1 male, Holotype, C. Dury collection (CMNH). *Kentucky*: EDMONSON CO., Mammoth Cave National Park, 24 Apr. 1961, Suter, 1 male, log mold (JAWC). Only these 2 specimens are known.

Pycnoplectus parki, new species

Type locality: Quincy, Adams Co., Illinois. Holotype male INHS.

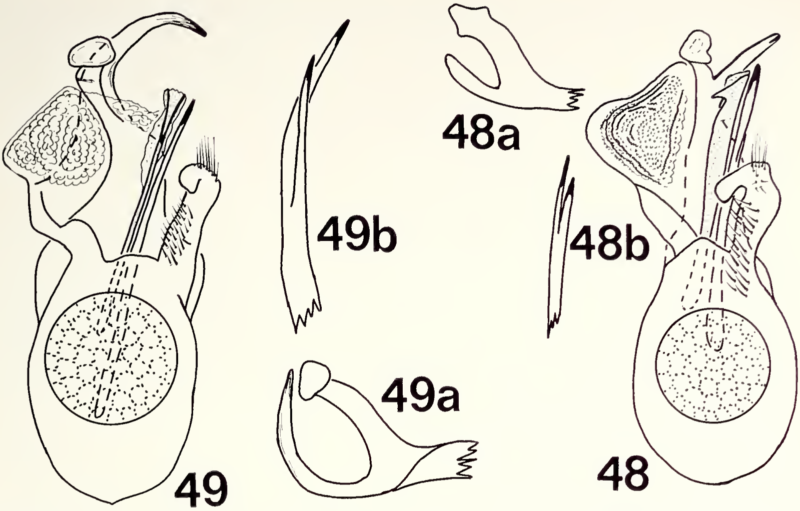
DISCUSSION: This new species has the general form and structural characteristics of *linearis* so that no detailed morphological description is needed. It differs from all other species in the genus by the secondary features of the male venter, its relatively larger size, and the ventral aedeagal lobe. It is a pleasure to name this new species for the late American authority on Pselaphidae, Orlando Park.

MEASUREMENTS OF HOLOTYPE MALE: Head .310 mm long × .404 mm wide, pronotum .422 mm long × .460 mm wide, elytra .580 mm long × .616 mm wide, abdomen .729 mm long × .580 mm wide, antenna .616 mm long × .088 mm wide, tergite ratio (1)-2-2-2-2.2-1, sternite ratio 1-1-1-.8-.5-.6-1.4, basal abdominal carinae maximum separation .176 mm, total length 2 mm.

DESCRIPTION: Punctation sparse but coarse, pubescence long, sparse, golden and semiappressed; color uniform red-brown.

Head: Vertexal foveae large, densely pubescent, connected by entire deep glabrous U-shaped sulcus; labrum with apical margin strongly convex with median subacute point; maxillary palpi with distal segment unusual: Twice as wide as third segment with short thick palpal cone at apex, dorsal surface swollen at apical three-fourths into small tubercular area; antennae as described in *linearis*.

Thorax: Pronotum with median longitudinal impression of disk very long, arising abruptly at apical three-fourths and continuing as deep sulcoid impression to enter transverse antebasal sulcus; elytra as described in *linearis*; legs rather short heavy, tibia, and femora thick,



Figs. 48–49. Figs. 48. *Pycnoplectus cediosus*, new species, aedeagus. 48a. Lateral view of ventral lobe. 48b. Accessory phallus. Fig. 49. *Pycnoplectus parki*, new species, aedeagus. 49a. Lateral view of ventral lobe. 49b. Accessory phallus.

mesofemora slightly heavier than others; coxae and trochanters lacking spines or lamellae.

Abdomen: First two visible tergites with basal carinae. Male venter: Fourth sternite with posterior margin tumuloid in median third, tumulus with shallow median impression; fourth-fifth intersegmental membrane with tubercle at center of lateral third, very transversely triangular wedge, three times wider than long; fifth sternite with deep fossa in median third with medial bisecting tubercle as described in *linearis*, posterior margin of fossa diagnostic: Deeply and sharply incised by triangular notch which separates margin into right and left oblique laminoid tubercle; sixth sternite with three small tumuli in triangular pattern, one at center of base and right and left tumulus in center; seventh sternite with carina arcuate to right (fig. 44).

Aedeagus: Ventral lobe bifid, both rami strongly upturned, main ramus arises first and terminates in club, second is lanceolate and curved strongly to left; accessory phallus bifid, ventral ramus slightly longer (fig. 49).

Material Examined: *Illinois*: adams co., Quincy, nr. Coe's Spring, 28 Apr. 1944, Rev. E. Long, 1 male, Holotype (INHS). *Ohio*:

HAMILTON CO., Cincinnati, Dury, 28 Oct. 1909, 1 male; 6 May 1919, 1 male; 24 Apr. 1921, 2 males; 13 Nov. 1909, 1 male, 1 female (CMNH). *North Carolina*: MACON CO., Highlands, 2.5 mi. NW, Van Hook Glade, 1–2 Sept. 1949, Dybas, 1 male (JAWC). The total number examined was 7 (6 males, 1 female); none had habitat data.

SEXUALIS GROUP

The three species here are most similar to those of the *linearis* group in general appearance and lack of leg armature. They are separated by the remarkable spines or spinoid tubercles of the male venter; these features are among the most extreme secondary sex characters for any euplectines. *P. spinifer* and *sexualis* are more closely related; the broad spinoid tubercle of *infossus* suggests the origin of the spines in the other two species.

Pycnoplectus sexualis (Casey), new combination

Euplectus sexualis Casey, 1884, p. 103. Type locality: South Carolina. Type male USNM no. 38614. Subsequent references: Brendel and Wickham, 1890, p. 63 (descript., key ref.). Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 31 (descript., key ref.).

DISCUSSION: *P. sexualis* is a larger species than its closest relative *spinifer*. It is most easily separated by the more elaborate spines of the male venter. These may appear broadly sulcate, to laminate and twisted at the end, some have a small additional spine which makes the whole spine resemble a miniature hand with the thumb pointed in.

MEASUREMENTS OF TYPE MALE: Head .281 mm long × .389 mm wide, pronotum .334 mm long × .389 mm wide, elytra .582 mm long × .563 mm wide, abdomen .530 mm long × .530 mm wide, antenna .530 mm long × .10 mm wide, tergite ratio 1-1-1-2-.8, sternite ratio ?-1-1-.8-.2-.8-1.4, basal abdominal carinae maximum separation .176 mm, total length 1.6 mm.

DESCRIPTION: Form as described in *linearis*, size large. Head quadrate, vertex convex with pubescent foveae; margins lateral to U-shaped frontal sulcus, rugose in some, normal in others. Pronotal disk convex with median elongate sulciform impression; lateral foveae deep, antebasal sulcus strong; legs and elytra as described in *linearis*. Abdominal carinae on first two tergites strong, entire, slightly incurved at tips. Male venter: Similar to *spinifer*, sternites 1 through 3 simple; fourth sternite broadly and feebly emarginate in median third with posterior angles roundly produced (margin nearly normal, unmodified in some populations), from under margin in lateral third a strong diverging variable spine extends over fifth segment: Spine sulcate in distal half, some laminate and twisted to end, some with small black acute thumblike spine at widest point (never simple and evenly curved as in *spinifer*); fourth-fifth intersegmental membrane with median tubercle; fifth sternite with deep fossa in median third with darkened tumid margin divided by median notch; sixth sternite with subreniform impression; seventh sternite convex, carina arcuate to right (fig. 50).

Aedeagus: Ventral lobe upturned and clubbed; accessory phallus bifurcate, left ramus curved resembling birds head (fig. 51).

MATERIAL EXAMINED: *South Carolina*: 1 male Type (USNM). *Maryland*: MONTGOMERY CO., Takoma Park, 21 Oct. 1951, Kissinger, 1 male (OP). *Washington, D.C.*: 3 Sept. 1964, Suter, 1 male, 1 female, forest floor (JAWC). *Florida*: BAKER CO., Macclenny, 5 mi. N., 18 Aug. 1965, Suter, 1 male, tree fork bush (JAWC); LEVY CO., Bronson, 27 June 1965, Suter, 1 male, sawdust (JAWC). *Alabama*: MOBILE CO., Mobile, 10 mi. S., W. shore of Mobile Bay, 17–20 Aug. 1949, Dybas, 1 male, 2 females, dusk flight (FMNH). *Mississippi*: JACKSON CO., Ocean Springs, 15 Oct. 1953, Dybas, 1 male (OP). The total number examined was 10 (7 males, 3 females).

HABITAT: No generalizations can be drawn from the seven collections. It is of interest that three specimens were taken by use of an air plankton net at dusk by Henry Dybas. This is an unique record for the genus.

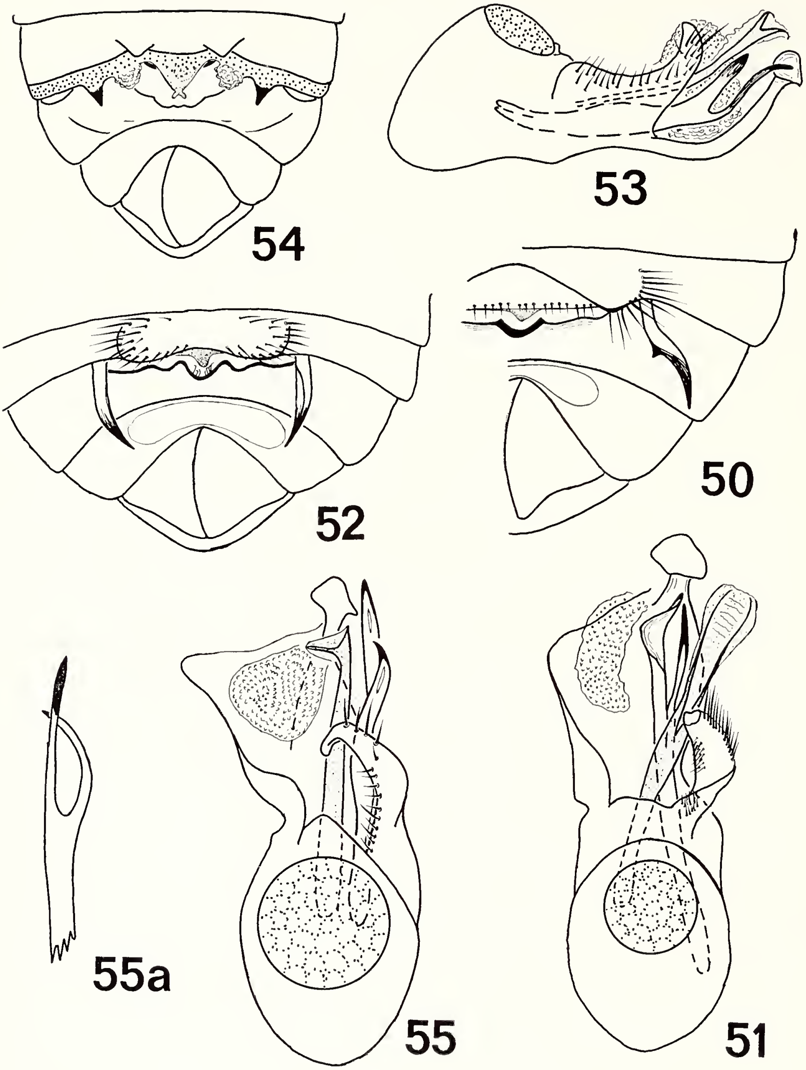
Pycnoplectus spinifer (Casey), new combination

Euplectus spinifer Casey, 1884, p. 104. Type locality: Columbus, Colorado Co., Texas. Type male USNM no. 38615. Subsequent references: Brendel and Wickham, 1890, p. 62 (descript., key ref., figs. 111, 117). Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 31 (descript., key ref.).

DISCUSSION: *P. spinifer* is a smaller species than its closest relative *sexualis*, and it seems to be much more abundant. It may be separated by the nature of the aedeagus, and the relatively more simple spines on the male venter.

MEASUREMENTS OF TYPE MALE: Head .228 mm long × .299 mm wide, pronotum .264 mm long × .320 mm wide, elytra .412 mm long × .440 mm wide, abdomen .475 mm long × .404 mm wide, antenna .422 mm long × .088 mm wide, tergite ratio 1-1-1-1.6-1, sternite ratio 1-1-1-.6-.5-.2-1.5, basal abdominal carinae maximum separation .123 mm, total length (range of several specimens) 1.2 to 1.4 mm.

DESCRIPTION: Form as described in *linearis*. Head quadrate, vertex convex with pubescent foveae; margins laterad to frontal sulcus



FIGS. 50–55. *sexualis* group of *Pycnoplectus*. Figs. 50–51. *Pycnoplectus sexualis* (Casey). 50. Sternites 4–7 of male. 51. Aedeagus (.281 mm long). Figs. 52–53. *Pycnoplectus spinifer* (Casey). 52. Sternites 4–7 of male. 53. Aedeagus, right lateral (.215 mm long). Figs. 54–55. *Pycnoplectus infossus* (Raffray). 54. Sternites 4–7 of male. 55. Aedeagus (.264 mm long). 55a. Accessory phallus.

not rugose. Pronotal disk with small feebly elongate impression; lateral foveae deep; legs and elytra as described in *linearis*. Abdominal carinae on first two tergites widely separated, nearly entire, slightly incurved at tips. Male venter: Similar to *sexualis*, sternite 1 through 3 simple; fourth sternite tumid in median third, margins of tumulus variable: Weak or obsolete to strong with sublaminate margin, in lateral third from under fourth sternite a long unbranched movable spine with shallow mesial sulcus in distal half, tip acute, sometimes blackened; spines pass over fifth and part of sixth sternites; fourth-fifth intersegmental membrane with median tubercle as described in *linearis*; fifth sternite with deep basal fossa in median third, margin of fossa trilobate and darkened, median lobe with several anterior pointing recurved setae; sixth sternite with shallow subreniform impression; seventh sternite with carina arcuate to right (fig. 52).

Aedeagus: Length .215 mm, form similar to *sexualis*, but accessory phallus with right ramus strongly recurved and left ramus broadly lanceolate (fig. 53).

MATERIAL EXAMINED: *Texas*: COLORADO CO., Columbus, 1 male Type (USNM). *Maryland*: BALTIMORE CO., Baltimore, 1 male (OP). *Florida*: ALACHUA CO., Gainesville, 1 Aug. 1956, Suter, 1 male, litter at log (JAWC); HIGHLANDS CO., Highlands Hammock State Park, 24 Aug. 1965, Suter, 2 males, subcortical log with *Passalus*, 1 male, buttress debris at log; 26 Aug. 1965, Suter, 1 male, 1 female, litter at log; 5 Apr. 1966, Wagner, 3 males, 4 females, floor mold; 6 Apr. 1966, Suter, 1 male, log mold (JAWC), Parker Islands, Lake Placid, 4 mi. E., 19 June 1955, Dybas, 1 male; 26 Aug. 1965, Suter, 1 male, 1 female, litter at log (JAWC); LEON CO., Chaires, 14 Aug. 1965, Suter, 1 male, sawdust (JAWC); COLUMBIA CO., Lake City, 7 mi. SE, 28 Aug. 1949, Dybas, 1 male, 1 female, under pine bark (FMNH); DIXIE CO., Old Town, 16 June 1965, Suter, 2 males, gum TH; 2 males, 4 females, palmetto stump (JAWC). *Alabama*: MARSHALL CO., Guntersville, nr. Griffith Cave, 19 June 1959, Suter and Wagner, 22 males, 23 females, old sawdust (JAWC). *Mississippi*: JACKSON CO., Ocean Springs, 10 May 1931, H. Dietrich, 1 male (OP); GEORGE CO., Lucedale, 10 Feb. 1931, Dietrich, 1 male, 3 females (OP). *Louisiana*: 2 males (ICCM); MADISON PR., Tallulah, 2 males, humus, Fall collection (MCZC); JEFFERSON PR., Harahan, nr. New Orleans, 1 male, under bark; 1 male, 1 female (INHS), 2 Dec. 1944, C. L. Remington, 1 male, 1 female, palmetto litter (OP). *Arkansas*: WASHINGTON CO., 2 Mar. 1940, M. W. Sanderson, 2 males (OP). *Tennessee*: MONROE CO., Sweetwater, 7 May 1955, W. J. Cloyd, 1 male, sawdust (OP). *Indiana*: LAPORTE CO., Smith Station, Davis Woods, 15 May 1961, Blinn and Suter, 1 male, stump mold (JAWC). *Illinois*: ALEXANDER

CO., Cache, 1 male, 1 female, TH, Olive Branch, 1 male, forest floor litter (INHS). *Iowa*: JOHNSON CO., Coralville, 17 Apr. 1965, Suter, 1 male, 2 females, under boards on sawdust (JAWC). The total number examined was 100 (58 males, 12 females).

HABITAT: Forest floor litter, log mold and old sawdust seem to be preferred habitats.

Pycnoplectus infossus (Raffray), new combination

Euplectus infossus Raffray, 1903, p. 541. Type locality: Pennsylvania. Type male Paris. Subsequent references: Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 32 (descript., key ref.). Park, 1956, p. 63 (descript., fig., distr. rec.).

Euplectus excavatus Bowman, 1934, p. 141. Type locality: Penn-Mar, Franklin Co., Pennsylvania. Type male ICCM. **New synonym.**

DISCUSSION: This species was known only from Raffray's original description until Park redescribed it. It is an uncommon species but easily distinguished by the remarkable features of the male venter. The Type of *excavatus* agrees exactly with the type of *infossus*, which I examined on loan from the Raffray collection, and it is clearly a synonym.

MEASUREMENTS OF TYPE MALE: Head .228 mm long × .334 mm wide, pronotum .299 mm long × .352 mm wide, elytra .457 mm long × .456 mm wide, abdomen .500 mm long × .457 mm wide, antenna .528 mm long, tergite ratio 1-1-1-1.5-1, sternite ratio 1-1-1-1.2-.4-.5-2, basal abdominal carinae maximum separation .105 mm, total length 1.46 mm (measurements on other specimens were slightly greater than those of the type male).

DESCRIPTION: Form robust, in general as for *linearis*. Head sparsely punctulate, margins barely subrugose, vertex convex with distant pubescent foveae. Thorax with convex pronotum, disk with small deep oval fovea one-third longer than wide, two-thirds as long as disk. Legs and elytra as described for *linearis*. Male venter: Fourth sternite complex: Posterior margin slightly toothed on each side of median third, below margin on intersegmental membrane a median rounded slightly concave process, on either side of median process an opaque white irregularly shaped lobe from intersegmental membrane, laterad of lobe on membrane a large conical acute spine that projects over fifth sternite; fifth sternite with deep fossa in basal three-fourths; sixth sternite with shallow subreniform impression; seventh sternite convex, carina arcuate to right (fig. 54).

Aedeagus: Ventral lobe clubbed, right lateral lobe strongly arcuate to left; accessory phallus bifid, both rami long, lanceolate, dorsal ramus curved (fig. 55).

MATERIAL EXAMINED: *Pennsylvania*: (WESTMORELAND CO.?), Rev. J. Schmitt, 1 male Type (Paris); FRANKLIN CO., Penn-Mar, 1 male, Type of *E. excavatus* (ICCM). *West Virginia*: RANDOLF CO., Bickle Knob, E. of Elkins, 19 June 1968, S. Peck, 3800 ft., 1 male, log litter (JAWC). *Kentucky*: HARLAN CO., Big Black Mountain, 11 July 1968, S. Peck, 4000 ft., 1 male, stump and log litter, with 1 male *P. longipennis* and 5 *Pycnoplectus* ?sp. females (FMNH). *Tennessee*: SEVIER CO., Smoky Mountains National Park, Cherokee Orchard, 17 Nov. 1953, Dybas and Auerbach, 2000 ft., 1 male, 1 female, maple TH (OP). *Georgia*: UNION CO., Brasstown Bald, 11 Aug. 1963, Steeves and Patrick, 2350 ft., 2 males, sawdust (HS); CLEBURNE CO., Heflin, 7 mi. N., 28 July 1962, R. C. and A. Graves, 1 male, 1 female, sawdust (JAWC), Talladega National Forest, 16 Apr. 1960, Steeves, 1 male, sawdust pile under slabs (HS); JACKSON CO., nr. Horseshoe Cave, 29 Apr. 1961, Steeves, 1 male, tulip TH (HS). The total number examined was 12 (10 males, 2 females).

HABITAT: Two collections each from tree holes and log mold; three from sawdust.

CONGENER GROUP

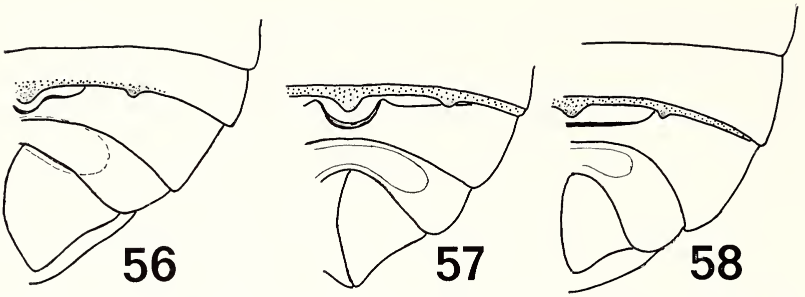
These species are separated by the presence of small spines or darkened lamina on the mesocoxae or metacoxae, or trochanters. The spatulate ventral lobe of the aedeagus is also a common feature and suggests these four species comprise a natural group.

Pycnoplectus congener (Casey), new combination

Euplectus congener Casey, 1884, p. 101. Type locality: Washington, D.C., Type male USNM no. 38613. Subsequent references: Brendel and Wickham, 1890, p. 67 (descript., key ref.). Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 30 (descript., key ref.).

Pycnoplectus tenellus Casey, 1897, p. 552. Type locality: St. Vincent, Westmoreland Co., Pennsylvania. Type male USNM no. 38619. Subsequent references: Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 34 (descript., key ref.). **New synonym.**

DISCUSSION: *P. congener* is readily distinguished from other *Pycnoplectus* by the laminoid projection on the metatrochanter and the spine on the mesocoxa. Furthermore, it is the only species of the *congener* group with the aedeagal accessory phallus simple, not bifid as in the others. It is the most abundant species in the group and has the greatest range. *P. tenellus* is separated in Bowman's key on the relative pronotal length-width ratio. My measurements indicate that



FIGS. 56–58. *congener* group of *Pycnoplectus*, male venters. Fig. 56. *Pycnoplectus congener* (Casey), sternites 4–7. Fig. 57. *Pycnoplectus longipennis* (Casey), sternites 4–7. Fig. 58. *Pycnoplectus difficilis* (LeConte), sternites 4–7.

there is no significant difference. External anatomy, as well as form of the aedeagus seem identical to that of *congener*, and *tenellus* must be considered a synonym.

MEASUREMENTS OF TYPE MALE: Head .316 mm long × .324 mm wide, pronotum .316 mm long × .324 mm wide, elytra .440 mm long × .470 mm wide, abdomen .475 mm long × .450 mm wide, antenna .475 mm long × .08 mm wide, tergite ratio 1-1-1-2-1, sternite ratio 1-1.2-1-.8-.2-.8-1.8, basal abdominal carinae maximum separation .123 mm.

DESCRIPTION: Head quadrate, convex vertex and lateral margins subrugose, pubescent foveae on line through middle of eyes, sulcus U-shaped, glabrous; gula punctate; mouthparts and antennae as for genus. Pronotum rounded-cordiform, disk with longitudinal sulcus not connected to glabrous antebasal impression; lateral foveae pubescent, connected to medial impression by arcuate antebasal sulci; prosternum convex, foveae as for genus; elytron with four antebasal foveae and subhumeral fovea; legs of males modified: Mesocoxa with small acute spine on mesoventral face, mesofemur swollen, metatrochanter with small curved laminoid process on posterior face. Male venter: Sternites 1 to 4 simple, unmodified; fourth-fifth intersegmental membrane with median process and small lateral tubercles; fifth sternite with deep basal fossa in median third, posterior margin trisinuate upturned and black at center; sixth sternite with shallow subreniform impression in central three-fourths; seventh sternite convex, carina arcuate to right (fig. 56).

Aedeagus: Ventral lobe spatulate, slightly upturned distally with many canaliculi; right lateral lobe similar to *interruptus* but more stout; accessory phallus simple, lanceolate, and not curving (fig. 59).

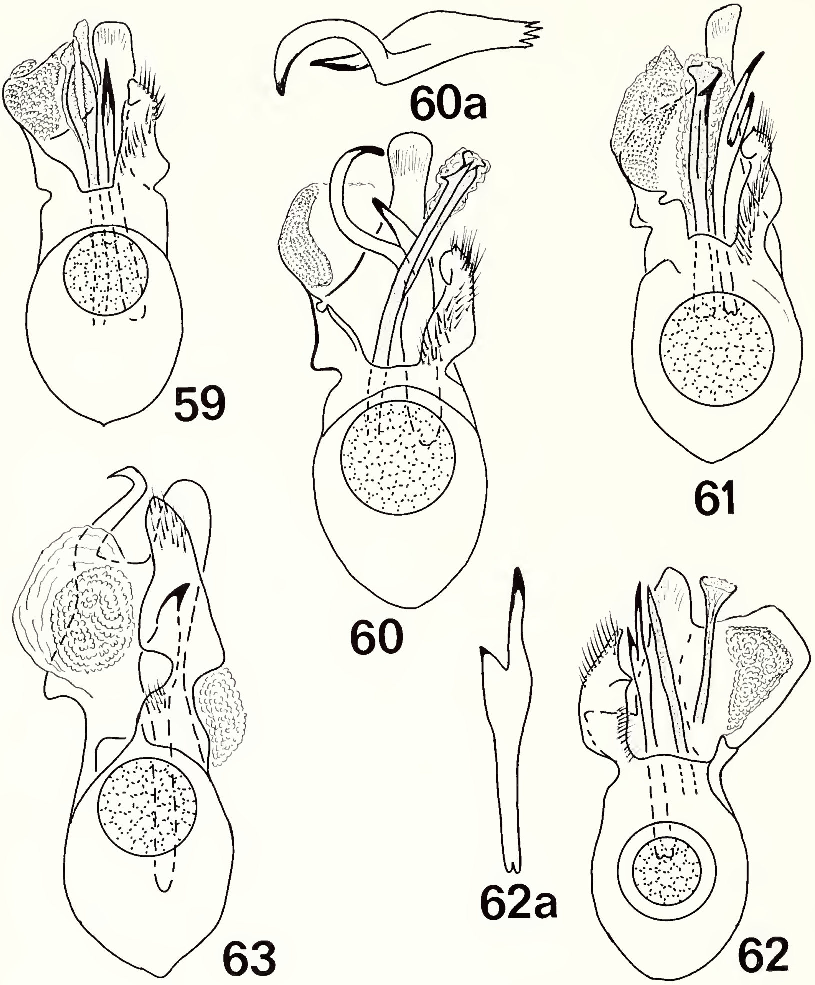
MATERIAL EXAMINED: CANADA: *Ontario*: ESSEX CO., Wheatley, nr. beach, 10 June 1967, Stephan, 1 male, sifting, Tilbury, 5 Sept. 1967, Stephan, 1 male, sifting (JAWC). UNITED STATES: *Washington, D.C.*: 1 male Type, 1 male paratype (USNM), 2 males (ICCM). *Connecticut*: LITCHFIELD CO., Colebrook, 2 July 1961, Wagner, Suter, Reichle, 1 male, sawdust (JAWC). *Pennsylvania*: 13 Oct. 1897, C. A. Schaffer, 1 male (OP); WESTMORELAND CO., Latrobe, St. Vincent, 1 male Type, 1 male paratype of *P. tenellus* (USNM). *Mississippi*: DESOTO CO., Hernando, 3 Apr. 1934, R. J. Nichols, 1 male (OP). *Ohio*: MAHONING CO., N. Jackson, swamp, 1 Sept. 1964, Suter, 2 males, beech stump (JAWC). *Michigan*: BERRIEN CO., Glenn, 14 Sept. 1947, Auerbach, 1 male, conifer log mold (OP); LIVINGSTON CO., E. S. George Reserve, 4 May 1960, Suter, 1 male, stump hole (JAWC). *Illinois*: CHAMPAIGN CO., Urbana, 5 males, 3 females, log mold (INHS), University Woods, Jan.–Feb. 1933, Park, 2 males, 2 females, log mold (OP), Brownfield Woods, 19 Apr. 1933, Park, 1 male (OP); COOK CO., DesPlaines, Carle Woods, 19 Apr. 1952, R. DePalma, 1 male, 4 females (OP), Palos Park, Maple Lake, 23 Apr. 1960, Wagner, 3 males, 1 female, oak TH (JAWC), Willow Springs, Paw Paw Woods, 1 male, TH (JAWC); DEWITT CO., Weldon State Park, 16 May 1966, Peck, 1 male, oak TH (JAWC); DUPAGE CO., Argonne National Laboratory, 10 Aug. 1967, Wagner and Suter, 1 male, oak forest floor (JAWC), Lisle, Morton Arboretum, 11 May 1959, Wagner, 1 male, under bark (JAWC); KANE CO., Lily Lake, Alt. 30, 3 mi. S., 22 Nov. 1960, Suter, 1 male, oak log mold (JAWC); SANGAMON CO., Sherman, 1 Feb. 1944, M. W. Sanderson, 2 males, (OP); VERMILION CO., Danville, 2 males, 2 females, log mold; 4 males, 1 female, stump mold (INHS); WILL CO., Monee, 11 Oct. 1952, Dybas, 1 male, 2 females (OP). The total number of specimens examined was 56 (41 males, 15 females).

HABITAT: The preference seems to be well rotted log mold.

Pycnoplectus longipennis (Casey), new combination

Euplectus longipennis Casey, 1908, p. 264. Type locality: St. Vincent, Westmoreland Co., Pennsylvania. Type female, USNM no. 38616. Subsequent references: Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 33 (descript., key ref.).

DISCUSSION: This species is similar to *congener* but can be separated by the unmodified mesocoxae and mesotrochanters. The aedeagal accessory phallus is deeply bifurcate.



FIGS. 59–63. Figs. 59–62. *congener* group of *Pycnoplectus*, aedeagi. 59. *Pycnoplectus congener* (Casey), aedeagus (.229 mm long). 60. *Pycnoplectus falcatus*, new species, aedeagus (.281 mm long). 60a. Left lateral view of accessory phallus. 61. *Pycnoplectus longipennis* (Casey), aedeagus. 62. *Pycnoplectus difficilis* (LeConte), aedeagus, sinistral form. 62a. Lateral view of accessory phallus. Fig. 63. *Acolonia cavicollis* (LeConte), aedeagus.

MEASUREMENTS OF PARATYPE MALE: Head .228 mm long × .316 mm wide, pronotum .281 mm long × .316 mm wide, elytra .440 mm long × .440 mm wide, abdomen .457 mm long × .404 mm wide, antenna .440 mm long, tergite ratio 1-1-1-2-1, sternite ratio .5-1-1-.5-.2-.4-1.2, basal abdominal carinae maximum separation .140 mm.

DESCRIPTION: General habitus identical to *congener*, separated from *congener* by following characters. Legs: Metatrochanter with small curved laminoid process of group; mesocoxa and mesotrochanter simple, without armature. Male venter: Sternites 1–4 simple; fourth-fifth intersegmental membrane with median process and small lateral tubercles; fifth sternite with deep basal fossa in median third, posterior margin of fossa arcuate, strongly upturned, almost sublaminoid, close to posterior margin of segment; sixth sternite with shallow subreniform impression; seventh sternite convex, carina arcuate to right (fig. 57).

Aedeagus: Ventral lobe spatulate as for group; accessory phallus bifid, gently curved, both rami strong and straight, mesial ramus slightly longer (fig. 61).

MATERIAL EXAMINED: *Pennsylvania*: WESTMORELAND CO., St. Vincent, 1 male paratype, 1 female Type (USNM). *Washington, D.C.*: 1 male (ICCM). *Maryland*: GARRETT CO., Keysers Ridge, 2.1 mi. E., 2500 ft., 18 June 1968, Peck, Ber. #129, 1 male, 2 females, log-stump litter (FMNH). *Virginia*: SMYTH CO., nr. Mount Rogers, Elk Garden Road, 5 Sept. 1961, C. Greever, 1 male, 1 female, sawmill debris (JAWC); WISE CO., Norton, 1.5 mi. S., 1500 ft., Peck, Ber. #133, 3 males, 1 female, log litter (FMNH). *Kentucky*: EDMONSON CO., Mammoth Cave National Park, Cabin Sink, 23 Apr. 1961, T. C. Barr and J. Wagner, 1 male, 1 female, log mold (JAWC); FLOYD CO., Jennie Wiley State Park, 7 July 1968, Peck, Ber. #134, 1 male, 1 female, log and stump mold (JAWC); HARLAN CO., Big Black Mountain, 4000 ft., 11 July 1968, Peck, Ber. #137, 1 male, log mold (JAWC). A total of 17 specimens (10 males, 7 females) from 8 collections.

HABITAT: Five of the above collections are from log mold, one from sawmill debris (sawdust?), the other two not known.

Pycnoplectus falcatus, new species

Type locality: Abingdon, Washington Co., Virginia. Holotype male (JAWC).

DISCUSSION: This new species is related to *difficilis* on the basis of the spined mesotrochanter, and to *congener* and *longipennis* on the basis of aedeagal form. The accessory phallus is unique, the left ramus is curved, resembling a sickle. The holotype male and paratype female were collected by Claud Greever and given to Orlando Park, who donated them to my collection.

MEASUREMENTS OF HOLOTYPE MALE: Head .264 mm long × .352 mm wide, pronotum .316 mm long × .369 mm wide, elytra .492 mm long × .563 mm wide, abdomen .580 mm long × .510 mm wide, antenna .528 mm long, tergite ratio 1-1-1-1.9-1, sternite ratio 1-1-1-.5-.5-.5-1.5, basal abdominal carinae maximum separation .123 mm, total length 1.65 mm.

Head: Trapezoidal, vertex convex, margins subrugose, pubescent vertexal foveae equally distant from each other and eyes, foveae connected by moderately deep U-shaped glabrous sulcus; labrum with median point; antennae as for group; ventral surface finely punctate.

Thorax: Elongate pronotal discal sulcus not connected to median antebasal impression, lateral pubescent foveae connected to median impression by arcuate antebasal sulci; anterior prosternal foveae obsolete, lateral prosternal foveae as for genus; elytron with four antebasal foveae, one subhumeral fovea, sutural stria entire, discal stria one-half elytron length.

Legs of male: All femora considerably swollen, metatrochanter with recurved lamina on ventral face, as for group; mesotrochanter with small, acute, mesial spine, as described in *difficilis*.

Abdomen: Basal abdominal carinae on first two tergites divergent. Male venter: Sternites 1–4 simple; fourth-fifth intersegmental membrane with median process and rounded tubercle in lateral third; fifth sternite with deep basal fossa, apical margin trisinuate, center upturned as described in *longipennis*; sixth sternite with shallow subreniform impression; seventh sternite convex, carina arcuate to right.

Aedeagus: Ventral lobe spatulate, slightly upturned apically; right lateral lobe recurved, with small terminal spine; accessory phallus bifid, left ramus broadly curved and sickle shaped, right ramus strong, lanceolate (fig. 60).

MATERIAL EXAMINED: *Virginia*: WASHINGTON CO., Abingdon, 1 mi. N., Cummings Woods, 7 Nov. 1961, C. Greever, 1 male Holotype, 1 female paratype, log mold (JAWC).

Pycnoplectus difficilis (LeConte), new combination

Euplectus difficilis LeConte, 1850, p. 106. Type locality: Athens, Clarke Co., Georgia. Type male MCZC no. 6191. Subsequent references: Casey, 1884, p. 100. Brendel and Wickham, 1890, p. 66 (descript., key ref., fig. 109). Raffray, 1911, p. 33 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 30 (descript., key ref.).

Euplectus longissimus Brendel, 1890, p. 71. Type locality: South Carolina, Georgia. Lectotype male Horn collection ANSP no. H9448.

Subsequent references: Raffray, 1911, p. 34 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 33 (descript., key ref.). **New synonym.**

DISCUSSION: This species has the typical habitus of the *congener* group. The distinguishing characters include 1) the trochanter characters of the mesolegs and metalegs, 2) the straight fossa margin of the fifth sternite, and 3) the unique aedeagus. There is one occurrence of aedeagal mirror imagery in *difficilis* among three genitalia examined. The type male showed the sinistral condition with the left lateral lobe setose. I examined the lectotype male of *Euplectus longissimus*, which I designated, and found it to be conspecific with *difficilis*. The aedeagus of the lectotype has the dextral form with the right lobe setose.

DESCRIPTION: General appearance identical to *congener*. Male legs: Mesotrochanter with acute spine directed posteroventrally, quite near coxa; metatrochanter with small laminoid lobe. Male venter: Sternites 1 through 4 simple; fourth-fifth intersegmental membrane with prominent median process, lateral tubercles rounded, equally distant from median process and lateral margin; fifth sternite with deep basal fossa in median third, posterior margin unique: Straight to slightly concave through length of entire fossa; sixth sternite with shallow subreniform impression; seventh sternite convex, carina arcuate to right (fig. 58).

Aedeagus: Two forms known, dextral and sinistral, dependant on transposition of right-left lateral lobes; ventral lobe spatulate with rounded point; accessory phallus bifid, ventral ramus short (fig. 62—sinistral form, 62a—lateral view accessory phallus).

MATERIAL EXAMINED: *Georgia*: CLARKE CO., Athens, 1 male Type, LeConte collection (MCZC); RABUN CO., Black Rock Mountain State Park, 16 Sept. 1959, Suter and Wagner, 1 male, 2 females, white oak TH (JAWC). *South Carolina* (?), *Georgia* (?), localities cited by Brendel for *longissimus*, no locality data on lectotype male, 1 (ANSP). The total number of specimens examined was five (three males, two females).

HABITAT: The only habitat reported is white oak tree hole.

Genus **Acolonia** Casey

Acolonia Casey, 1893, p. 443, 454. Type species, *Acolonia cavicollis* (LeConte), 1878, p. 387 (original genus *Euplectus*). Subsequent references: Raffray, 1903–04, p. 95 (cat. citation); 1908, p. 95 (descript., distr.); 1911, p. 38 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 39, 144 (descript., key ref., designation of type species). Park, 1953, p. 305, 314 (key ref., cat. citation). Arnett, 1961, p. 315, 321 (key ref., cat. citation).

DISCUSSION: This monotypic genus resembles *Pycnoplectus* more than *Euplectus*. The simple venter of the male, and form of the aedeagus separate it from these genera. The short sulci above and below each eye are distinguishing features which immediately separate *Acolonia* from the other three genera presented here. Thus far it has only been collected in Florida and is known only from the type, and a subsequent single female collected in 1955. Considering the intensity of collecting in Florida in recent years, this must be considered one of the most uncommon pselaphid genera.

DESCRIPTION: Form stout and convex, rather like *Pycnoplectus*.

Head: Eyes prominent, toward ventral surface, lateral margins strong, connected with frontal ridge so that discounting eyes, head has strong trapezoidal outline; vertexal foveae nude, connected by deep V-shaped ambient sulcus, vertex medially convex with short median carina to occiput; short sulcus above and below eye; ventral surface punctate.

Thorax: Pronotal disk convex, not impressed, punctulate; antebasal fovea small, deep, in large rounded transverse depression which does not connect with deep lateral foveae; prosternum long, not carinate; lateral prosternal foveae large, pubescent, near coxal cavity; anterior prosternal foveae replaced by glabrous sulcus; elytra widest part of body, nearly parallel at sides, each elytron with four antebasal foveae; sutural stria complete, discal stria shallow and short; subhumeral foveae with complete stria.

Legs: Relatively unmodified; mesofemora and metafemora inflated; mesotibia with distinct, but small distal spine.

Abdomen: Hypotergite and five visible tergites, first two with strongly diverging carinae; 1 through 3 subequal; fourth much longer; fifth as long as first. Male venter: Sternites 1 through 6 simple, unmodified; seventh sternite with two opercular plates, junction "carina" arcuate to right.

Aedeagus: Large basal capsule as described for *Pycnoplectus*; ventral lobe strong, deeply incised; right lateral lobe very large (fig. 63).

Acolonia cavicollis (LeConte)

Euplectus cavicollis LeConte, 1887, p. 387. Type locality: Tampa, Hillsborough Co., Florida. Type male MCZC no. 6192. Subsequent references: Brendel and Wickham, 1890, p. 57 (descript., key ref.).

Acolonia cavicollis (LeConte), Casey, 1893, p. 443, 454 (defined new genus with *cavicollis* as type species). Raffray, 1903, p. 95 (cat.

citation); 1911, p. 38 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 39 (descript., key ref.).

DISCUSSION: Since this is the only species in the genus it is easily separated by the features previously mentioned in the generic discussion and the generic key.

MEASUREMENTS OF TYPE MALE: Head .246 mm long × .334 mm wide, pronotum .299 mm long × .352 mm wide, elytra .460 mm long × .510 mm wide, abdomen .528 mm long × .440 mm wide, antenna .480 mm long, tergite ratio 1-1-1-1.8-1, sternite ratio 1-1-.8-.7-.5-.5-2.0, basal abdominal carinae of first and second tergites: minimum separation .088 mm curving to maximum separation .158 mm.

REDESCRIPTION OF TYPE MALE: Form moderately robust, dark brown; pubescence dense and suberect; head wider than long, smaller than pronotum; eyes large, tempora short and strongly convergent; vertexal foveae nude, connected with deep V-shaped ambient sulcus, vertex densely but finely punctulate laterally, medially convex with short antebasal carina; antennal club of last three segments; terminal segment as long as preceding three united; ventral surface of head punctate; prosternum coarsely punctate; pronotal disk convex, punctulate, not impressed; antebasal fovea small, deep, in large rounded transverse depression; lateral foveae deep, not connected to median depression; elytra as described for genus; basal abdominal carinae on first two tergites curved and strongly divergent. Male venter: Seven sternites in male apparently unmodified except for fifth sternite with small basal impression, .12 mm long in middle; sixth sternite with weak lateral glabrous depressions; seventh with carina arcuate to right. *Aedeagus*: Ventral lobe distally bipartite: Left part in form of strong recurved spine, right part broadly spatulate; right lateral lobe setiferous, large, roundly incised in basal half; accessory phallus simple, not divided (fig. 63).

MATERIAL EXAMINED: *Florida*: HILLSBOROUGH CO., Tampa, 1 male Type (MCZC); CLAY CO., Highland, 5 mi. N., 23 June 1955, H. Dybas, 1 female, under pine bark (JAWC).

Genus **Leptoplectus** Casey

Leptoplectus Casey, 1908, p. 266. Type species: *Leptoplectus pertenuis* (Casey), 1884, p. 109. Subsequent references: Raffray, 1911, p. 35 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 34, 144 (descript., key ref., designation of Type species).

Euplectus: Park, 1953, p. 314 (cat. citation). Arnett, 1961, p. 321 (cat. citation).

DISCUSSION: This is a relatively abundant monotypic genus in Eastern North America. It is separated from *Euplectus* by its pubescent vertexal foveae, one sensory fossa in the eleventh antennal segment, none of the male venter modifications characteristic of *Euplectus* or *Pycnoplectus*, and a distinctive aedeagus. The closest relative of *Leptoplectus* is a new, undescribed genus represented by a single female from Kyoto, Japan. The general appearance and notched labrum are identical to that of *Leptoplectus*, but it lacks anterior prosternal foveae.

DESCRIPTION: Body slender, small, sides parallel, color pale brown, elytra sometimes darker.

Head: Rounded trapezoidal, evenly and sparsely punctulate, tempora long, eyes placed low on sides; vertex slightly convex, foveae small, pubescent, connecting with broad glabrous frontal impression by shallow constricted sulci; frontal margin upturned, darkened and medially pointed; labrum with deep median U-shaped notch; mandibles simple, lacking spinoid seta; occiput with small median basal notch (fig. 14); ventral surface punctulate with short, aciculate, semi-appressed anteriorly directed setae; terminal segment (eleventh) of antenna with subapical fossa containing several sensilla (fig. 11).

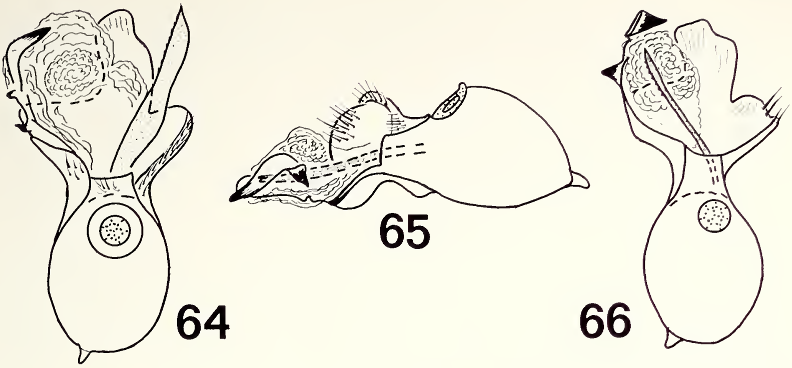
Thorax: Pronotum punctulate, disk with small oval impression that connects weakly with antebasal impression; lateral foveae pubescent, connected to antebasal impression by very weak sulci; lateral margins with small but distinct, rounded denticle next to fovea; lateral prosternal foveae (LPF) pubescent; anterior prosternal foveae (APF) pubescent; prosternum convex, impunctate. Legs: Simple, procoxal and mesocoxal cavities confluent, metacoxal cavities contiguous; elytra quite variable with respect to number of antebasal foveae: Bifoveate, with sutural and humeral, or trifoveate, with sutural, discal, humeral; on same individual each elytron can be different; subhumeral fovea with entire stria.

Abdomen: Hypotergite and five visible tergites, first two visible tergites with basal carinae; fourth larger; fifth tergite in some females with middorsal terminal spine; females with six sternites, male with seven; seventh sternite with two plates, uniting carina arcuate to morphological right.

Aedeagus: Form distinct but with considerable variation; basal capsule elongate with basal nipple; left lateral lobe with spines; ventral lobe spatulate; right lateral lobe with setae (figs. 64, 65, 66).

Leptoplectus pertenuis (Casey)

Euplectus pertenuis Casey, 1884, p. 109. Type locality: Washington, D.C. Type female USNM no. 38607. Subsequent references: Brendel and



FIGS. 64–66. *Leptoplectus pertenuis* (Casey). 64 & 66. Dorsal view of aedeagi, two variations (.190 mm long). 65. Left lateral view aedeagus.

Wickham, 1890, p. 70 (descript., distr. data, key ref.). Raffray, 1903, p. 91 (cat. citation).

Leptoplectus pertenuis (Casey), 1908, p. 266 (first placed in genus). Raffray, 1911, p. 35 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 35 (descript., key).

Leptoplectus insolens Casey, 1908, p. 268. Type locality: St. Vincent, Westmoreland Co., Pennsylvania. Type male USNM no. 38609. Subsequent references: Raffray, 1911, p. 35 (cat. citation). Leng, 1920, p. 128 (cat. citation). **New synonym.**

Leptoplectus exilissimus Casey, 1908, p. 269. Type locality: Cincinnati, Hamilton Co., Ohio. Type male USNM no. 38610. Subsequent references: Raffray, 1911, p. 35 (cat. citation). Leng, 1920, p. 128 (cat. citation). Bowman, 1934, p. 35 (descript., key). **New synonym.**

DISCUSSION: There have been four species described in *Leptoplectus*, all by Casey. One, *filiformis*, is clearly *Euplectus* and is included in this genus. The remaining species have been described from only five specimens: *pertenuis*, one Type and one paratype female; *insolens*, one Type male; *exilissimus*, one Type and one paratype male. I have examined these specimens as well as 100 males, and 119 females from 70 separate collections over the total range, and I have not been able to distinguish more than one species on the basis of external and aedeagal anatomy. There was relatively little variation in size, but 50 males across the entire range were measured for head and pronotum dimensions, and from these a head/pronotal index was derived (Mayr et al., 1953, p. 136). The head/pronotal indices for the types of *insolens* and *exilissimus* were well within the limits of expected deviation for the 50 males of *pertenuis*. Although the samples studied are small, I feel that only one species population is present.

MEASUREMENTS OF *INSOLENS* TYPE MALE: Head .228 mm long × .264 mm wide, pronotum .246 mm long × .250 mm wide, elytra .369 mm long × .352 mm wide, abdomen .440 mm long × .305 mm wide, antenna .316 mm long × .08 mm wide, basal abdominal carinae maximum separation .075 mm.

MEASUREMENTS OF *EXILISSIMUS* TYPE MALE: Head .193 mm long × .228 mm wide, pronotum .213 mm long × .213 mm wide, elytra .334 mm long × .316 mm wide, abdomen .352 mm long × .264 mm wide, antennae damaged, basal abdominal carinae maximum separation .06 mm.

DESCRIPTION: Total length 1.0 to 1.3 mm; color brown, form depressed, sides parallel; head rounded trapezoidal with two small pubescent vertexal foveae; surface lightly and finely punctulate; front with shallow glabrous impression, frontal margin upturned, darkened, medially pointed; sulci from foveae to frontal impression constricted on line through anterior half of eyes; labrum truncate with deep median U-shaped notch (fig. 14). Antennae, pronotum, elytra, legs, and abdomen as described for genus.

Aedeagus: Basal capsule elongate with basal nipple; left lateral lobe with two lanceolate processes (these vary considerably in degree of curvature and sclerotization but always occur in same relative position and should be viewed at several angles) usually only tip of process darkened, in some (including Type of *insolens*) darkened blade quite long; right lateral lobe curved with many setae; ventral lobe spatulate; no accessory phallus; phallus often obscured by anteapical membrane, flat and spatulate, or bifurcate (figs. 64–66).

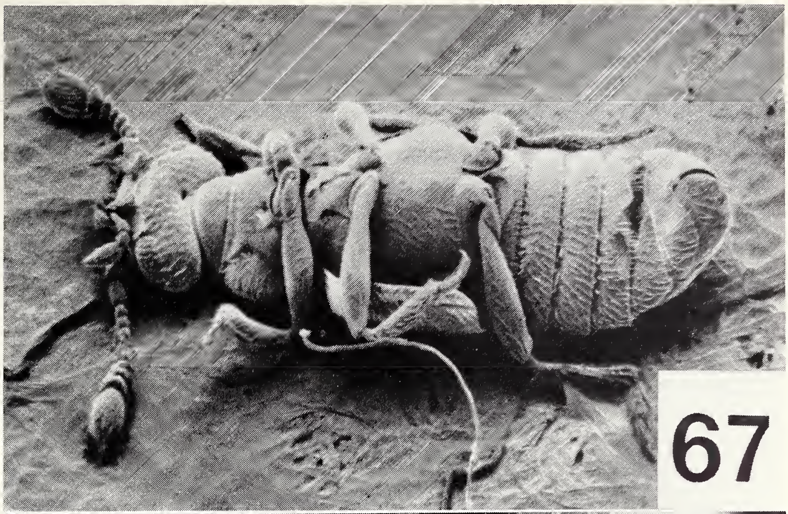
MATERIAL EXAMINED: *Washington, D.C.*: 1 female Type (USNM), 2 males (ICCM). *Rhode Island*: WASHINGTON CO., Rickville, nr. Ell Pond, 4 July 1961, Wagner, 1 male, mountain laurel duff (JAWC), S. Kingston, Great Swamp, 3 July 1961, Suter, Wagner, Reichle, 5 males, 7 females, sawdust (JAWC). *New Jersey*: CAMDEN CO., Clementon, 27 July, 1 male, 1 female; GLOUCESTER CO., Woodbury, 24 June, 2 males, 4 females, Westville, 10 Nov., 8 males, 12 females, H. W. Wenzel collection (OSUC). *Pennsylvania*: DELAWARE CO., Castle Rock, 1 male, Newton Square, 1 male (OSUC); PHILADELPHIA CO., Frankford, 1 male, 1 female (OSUC); FRANKLIN CO., Penn-Mar, 27 July 1959, Suter and Wagner, 2 males, 3 females, log mold (JAWC); WESTMORELAND CO., St. Vincent, 1 female (USNM), 1 male Type of *insolens* (USNM), 1 male (OSUC), 1 male, 1 female (CMNH), Seward, 28 July 1959, Suter and Wagner, 4 females (JAWC), Chestnut Ridge, E. of Youngstown, 16 Sept. 1961, Wagner, 2 females, log mold (JAWC). *Delaware*: NEW CASTLE CO., Christiana, 31 May 1953, R. S. Howard, 2 males, 5 females (OP). *Maryland*: Green Ridge Mountain, 16 Dec. 1946, H. Ross, 1 male, 1 female, forest litter (OP); BALTIMORE CO., Baltimore, 22 Apr. 1934, T. Edwards, 1 male, 1 female (OP); FREDERICK CO., South Mountain, Middletown, 3 mi. N.W., 21 Nov. 1961, H. Dybas, 1 male, 2 females, hollow stump debris (JAWC); GARRETT CO., Deer Park, 3 mi. W., 25 July 1959, Suter and Wagner, 1 female, sawdust (JAWC). *Virginia*: SMYTH CO., nr. Mount Rogers, Elk Garden Road, 3 Sept. 1962, C. Greever, 1 male; 5 Sept. 1961, Greever, 1 male, 1 female, sawmill debris (OP). *North Carolina*: BUNCOMBE CO., Ashville, 10 mi. W, 1 female, leaf mold (OP); POLK CO., Tryon, 21 Nov. 1949, L. Eisenbach, 3 males, 1 female, TH (OP). *South Carolina*: OCONEE CO., Oconee State Park, 100 ft., 21 July 1967, Peck and Fiske, Ber. #83, 12 males, 4 females, log litter (FMNH). *Georgia*: DADE CO., Cloudland Canyon State Park, 14 Apr. 1963, Steeves, 2 males, 2 females, forest floor nr. dead wood (HS), 19 June 1967, Peck and Fiske, Ber. #64, 5 males, 6 females, sawdust (FMNH); RABUN CO., Mountain City, Black Rock Mountain State Park, 16 Sept. 1959, Suter and Wagner, 3 males, 1 female, log mold (JAWC), Rabun Bald, 3630 ft., 30 May 1964, Steeves, 1 male, 1 female, oak TH (HS); WHITE-UNION CO., Tesnatee Gap, 3100 ft., 20 July 1967, Peck and Fiske, Ber. #81, 2 males, 2 females, log mold (FMNH). *Florida*: JACKSON CO., Florida Caverns State Park, 6 Apr. 1969, Peck, Ber. #159, 2 males, 2 females, log leaf litter 131 lbs., 130 liters (JAWC); LIBERTY CO., Torreya State Park, 4 Apr. 1969, Peck, Ber. #158, 1 male, 1 female, pine log litter 194 lbs., 185 liters (FMNH). *Alabama*: CULLMAN CO., nr. Cullman, Hurricane Creek Park, 6 July 1963, Steeves, 1 female, log mold; FRANKLIN CO., nr. Hodges, Rock Bridge Canyon, Steeves, 1 female; JACKSON CO., nr. Princeton, Horseshoe Cave Sink, Steeves, 2 males, moss at cave mouth; 1 male, 1 female, log mold; MARSHALL CO., Grant, Guffey Cave, Steeves, 1 male, debris in entrance; PIKE CO., nr. Troy, The Pocosin, Steeves, 1 female, floor litter; SHELBY CO., Oak Mountain State Park, 26 Mar. 1961, Steeves, 1 female, log mold, 2 females, TH; nr. Helena, 1 female, log mold; WALKER CO., nr. Jasper, Devils Ladder, Steeves, 1 female, hollow oak (all Alabama collections HS). *Tennessee*: BLOUNT CO., 1953, T. Copeland, 5 males, sawdust (OP); OVERTON CO., Standing Stone State Park, Steeves, 1 female, stump mold (HS), Pickett State Park, Steeves, 1 female, log mold (HS); SEVIER CO., Smoky Mountains National Park, 2.5 road mi. above Chimney Campground, 3600 ft., 1 male, basswood log (OP); VAN BUREN CO., Fall Creek Falls State Park, 1 male, floor litter (JAWC).

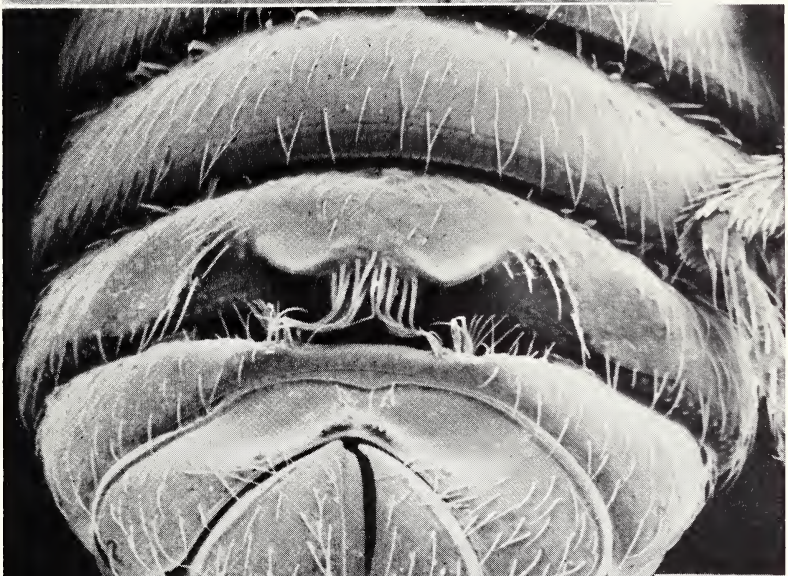
Kentucky: FLOYD CO., Jennie Wiley State Park, 7 July 1968, Peck, Ber. #134, 1 male, 3 females, log and stump litter 188 lbs., 164 liters (FMNH); HART CO., Munfordville, 4 mi. N. on US 31W, 31 Aug. 1961, Suter and Wagner, 4 males, 3 females, floor litter (JAWC); PULASKI CO., Burnside, 3 Sept. 1948, Ross and Stannard, 2 males, log mold (OP), 1 male, 2 females (INHS). *Ohio*: HAMILTON CO., Cincinnati, 17 May 1906, C. Dury, 1 male, 3 females (CMNH), 1 male Type of *exilissimus* (USNM). *Indiana*: MONROE CO., Bloomington, 21 Apr. 1934, M. L. Connerly, 1 male, 2 females (OP). *Illinois*: ADAMS CO., Quincy, 1 male, 3 females; Spring Lake Country Club, 1 male, log mold; Coe's Spring, 24 Apr. 1944, Rev. Long, 2 males, stump mold; 1 male, 1 female, TH (all INHS); ALEXANDER CO., Thebes, 3 females, on log in beech woods (INHS); CARROL CO., Palisades State Park, 2 males, 1 female (INHS); CHAMPAIGN CO., Urbana, 19 Apr. 1934, Park, 1 male (OP), Mahomet, 3.5 mi. S., 2 females, oak TH (INHS); HARDIN CO., Eichorn, 1 female (INHS); MASON CO., Havana, 1 male, 1 female, log mold (INHS); LA SALLE CO., Starved Rock State Park, 1 male, 1 female, log mold (INHS); PIATT CO., White Heath, 17 May 1934, Park, 1 male, 1 female (OP); POPE CO., Herod, 12 Oct. 1933, H. Ross, 1 male, 1 female, log mold (INHS); PUTNAM CO., Magnolia, 1 female, floor litter; UNION CO., Alto Pass, 1 female, floor litter, Cobden, 23 Aug. 1960, Wagner, 1 female, log mold, Ware, 1 male, 4 females, log mold (JAWC); VERMILION CO., Danville, 3 females, log mold; 1 male, 2 females, stump (INHS). *Iowa*: JOHNSON CO., nr. Solon, Lake McBride State Park, 14 Apr. 1963, Suter and Berry, 2 males, 3 females, oak TCH (JAWC). The total number of specimens examined was 224 (103 males, 121 females).

HABITAT: The majority of collections were from log mold with about 25 percent as many from floor litter, tree holes, and sawdust.

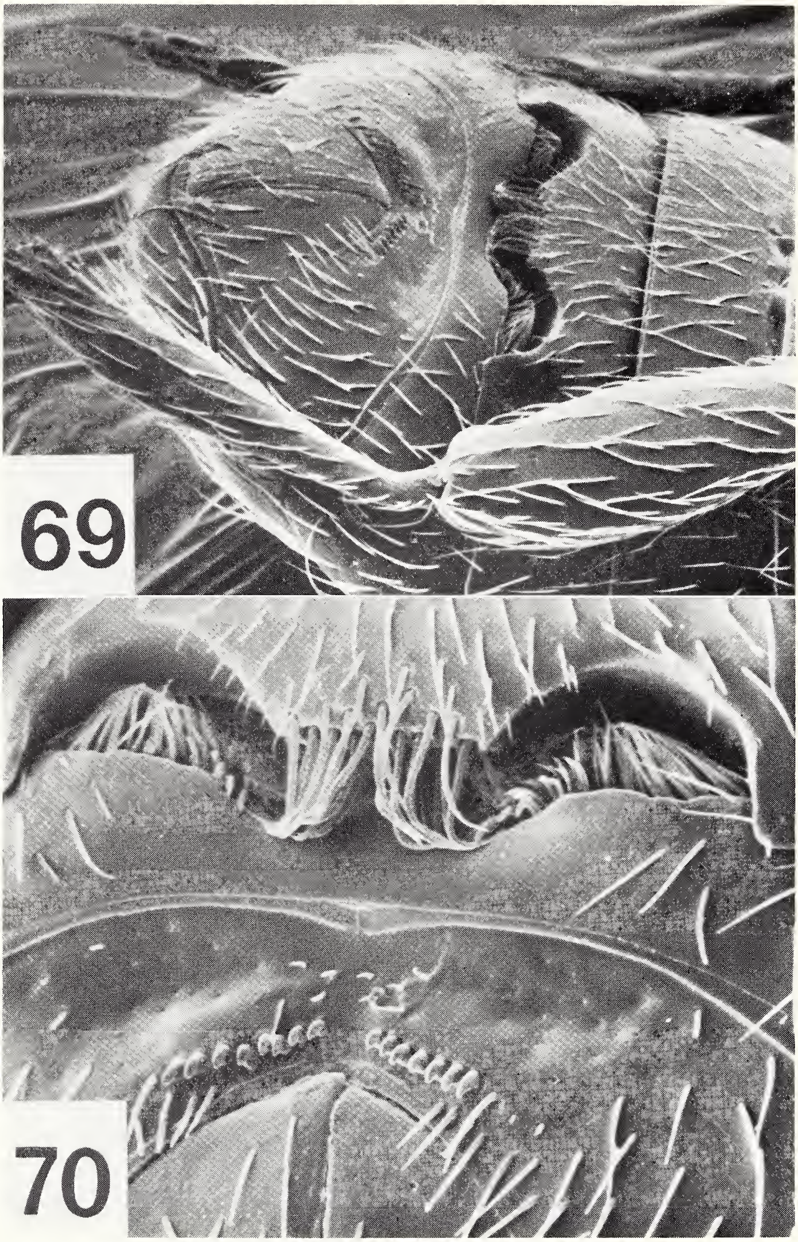
ECOLOGY

Euplectus, *Pycnoplectus*, *Leptoplectus*, and *Acolonia* are most frequently found in the Nearctic in the deciduous forest biome and its extensions. Here these beetles are much more common and have larger populations in the climax associations, although there are a few less common species which may be limited to preclimax stages; about 85 percent of all pselaphids live in leaf and log mold of the forest floor. Pselaphidae are predacious and feed on a variety of mold-inhabiting animals. Apparently their role in the community is active predation upon cryptozoic herbivores. Pselaphids help to maintain the balance in humus formation by consuming mites, Collembola, and other small creatures.

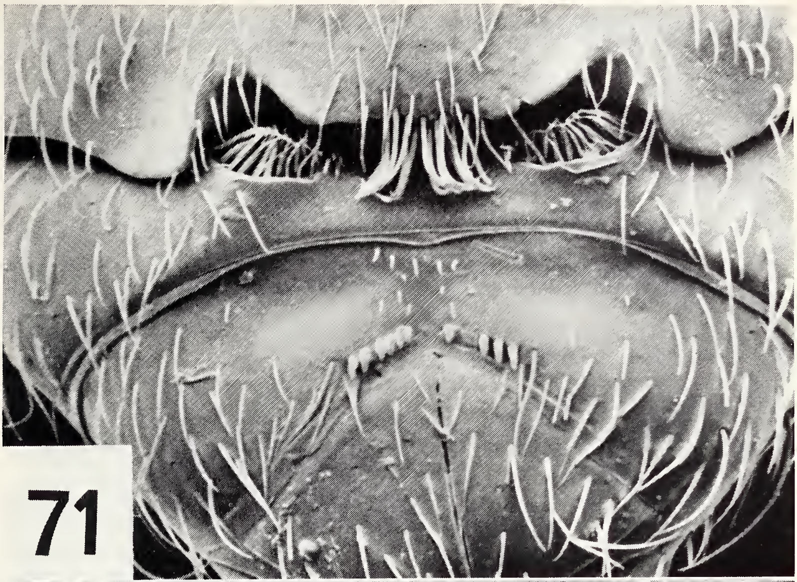




FIGS. 67–68. *Euplectus longicollis* Casey, SEM photograph of male from Kentucky, Edmonson Co., Mammoth Cave National Park, Bruce Hollow. 67. Ventrolateral view. 68. Sternites 3–7.



FIGS. 69–70. *Euplectus karsteni* (Reichenbach), SEM photograph of male from Illinois, Cook Co., Skokie. 69. Left oblique view of venter. 70. Sternites 4–7, central portion (note attachment of central setae of fourth sternite, and sensillae of sixth).



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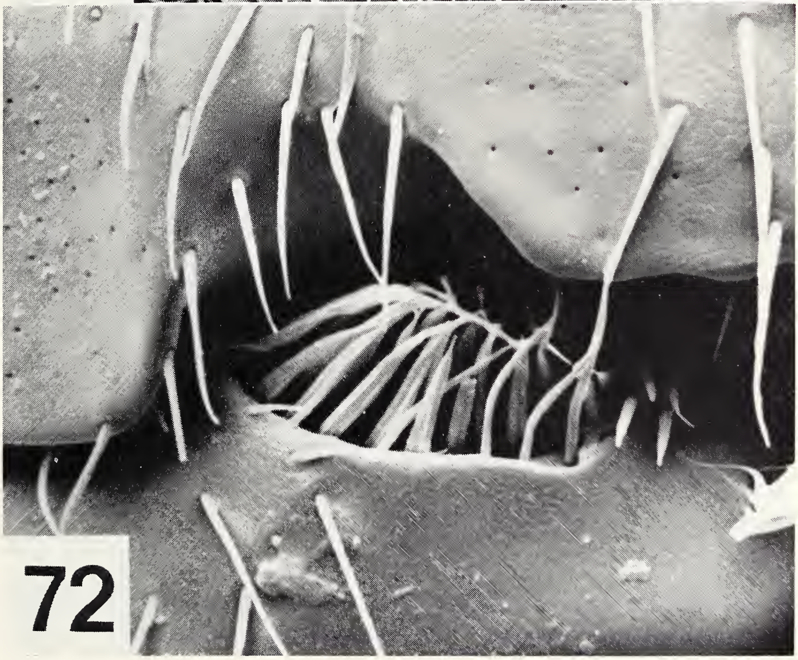

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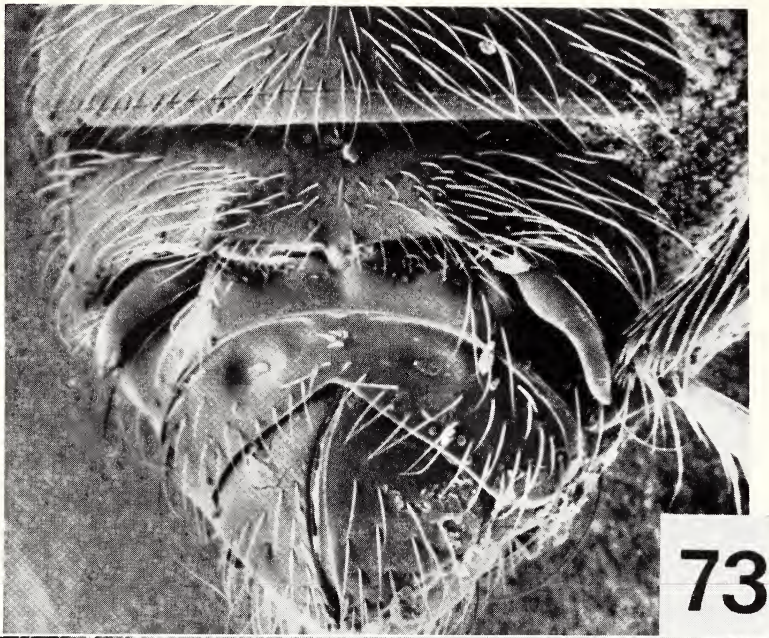
FIGS. 71–72. *Euplectus karsteni* (Reichenbach), SEM photograph of male from Switzerland, Geneva. 71. Sternites 4–7 (note variation in attachment of central setae of fourth sternite). 72. Detail of setal tuft in fossa of fifth sternite.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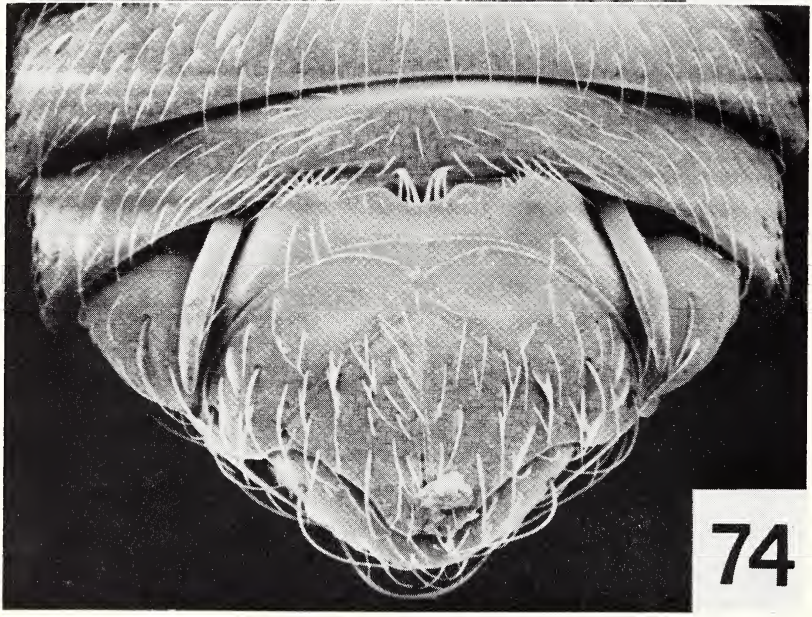
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FIGS. 73–74. Fig. 73. *Pycnoplectus sexualis* (Casey), SEM photograph of a male from Washington, D.C., sternites 3–7. Fig. 74. *Pycnoplectus spinifer* (Casey), SEM photograph of a male from Alabama, Marshall Co., Guntersville, nr. Griffith Cave, sternites 3–7.

FEEDING. Pselaphids are known to feed on oribatid mites, hoplodermatid mites, gamasid mites, ant eggs and larvae, fly larvae, collembolans, small flies, and pieces of earthworms (Park et al., 1950). Englemann (1956) reported *Euplectus* (one male, two female species) feeding upon podurid and isotomid Collembola. I have fed *E. confluens* larvae of *Drosophila*, *Tubifex* worms, mites, and collembolans. They fed upon the larvae with apparent reluctance and only after the integument had been broken. This is in contrast to the apparent gusto shown by many other pselaphid genera when fed *Drosophila* larvae under laboratory conditions. *Tubifex* worms were attacked and eaten by *confluens* especially when the worms were cut into small pieces. Mites and Collembola and a variety of other small arthropods were usually collected alive with the pselaphids, but the beetles were not seen feeding upon any of the forms present except one unidentified mite.

PREDATORS. The red-backed salamander, *Plethedon cinereus* (Green), is the only known predator of pselaphids. Park (1947, p. 103, 115) reports *Batrisodes hairstoni* Park (Clarke County, Indiana) from this salamander's stomach; Park and Edgren (1950) add a female *Tychus minor* LeConte and a male *Melba sulcatula* (Casey) from Berrien County, Michigan. I collected *P. cinereus* with 125 female *Eutyphlus* by Berlese funnel, from floor duff under *Rhododendron* on Chestnut Ridge, East of Youngstown, Pennsylvania, 16 September 1961. A gut examination produced a partly digested *Eutyphlus* female. Although none of the *Euplectus* complex is known from predation records, members of the same tribe, *Melba* and *Eutyphlus*, have been eaten. Evidently any pselaphid in log mold or floor litter might be eaten by small salamanders. Arthropod predation undoubtedly occurs, but has not been substantiated.

SYMBIOSIS. Mites: "It is well known that gamasoid mites are associated with beetles, either as phoretics or ectoparasites. On one occasion, a sample from a basal tree hole (July 4, 1949 at Saugatuck, Michigan) yielded three males and 29 females of *E. confluens*. Of these, 12 females were parasitized by gamasoids, each female having from two to 12 mites" (Park et al., 1950, p. 39). During my examination of several hundred *Euplectus* and *Pycnoplectus* only six percent had mites on them. Since they were examined as dried, point mounted specimens, most of the associated mites may have fallen off during Berlese collection in alcohol, and subsequent sorting and mounting. Of the beetles seen alive, none was seen carrying mites. Nematodes: A Berlese collection from a compost pile on 3 November 1960, Friendship, Adams County, Wisconsin produced several *E. signatus*. Larval nematodes were attached to the cuticle of five *Eu-*

plectus, two different scydmaenids, and a cryptophagid, *Diplocoelus rudis* LeConte. There were from two to six nematodes on each pselaphid, located apparently at random. Apparently they were not ectoparasites, but phoretics. Hyman (1951, Vol. III, p. 291) discusses the ecology of Rhabditoidea. These generally terrestrial worms often inhabit compost piles. Immature stages of certain species are often transported by insects to other habitats, and the worms may parasitize the insects in certain stages of development. This occurrence of nematodes on *Euplectus* may parallel the situation on the dung beetle, *Aphodius*, as outlined by Hyman. Another collection of *Euplectus* six months later on 10 April 1961 at the same site produced no nematodes. Ants: Several collections from tree holes and log mold contained ant colonies. *Euplectus* and *Pycnoplectus* were present in some of these collections, but their association with ants, if any, is speculative. It is possible that the beetles are facultative synecthrans, but in the ample literature dealing with social insects symbiont euplectines are not mentioned.

POPULATION DENSITIES. Concentrated litter, log mold, and tree hole mold were taken to the laboratory in plastic bags which held about two liters or two kilograms (wet weight) of the mold. Many collections did not yield euplectines, but unfortunately no record was made of these for comparative study. The average sample of mold (two to four kilograms) yielded only small numbers of *Euplectus*, *Pycnoplectus*, and *Leptoplectus*. The number of beetles in each collection, the totals and numbers of each sex have already been listed for each species. The following two collections provide some data on relative number of beetles per volume and weight of habitat substrate. 1) A *Tilia* tree hole in Carle Woods (Illinois, Cook County, Des Plaines, 15 March 1959) contained 16 male and 21 female *E. confluens*, approximate volume, two liters; wet weight, 1775 grams; dry weight, 775 grams; or one *confluens* per 54 ml. of mold, or one per 48 grams of wet mold. 2) An *Acer* tree hole in Raccoon Grove (Illinois, Will County, Monee, 18 December 1959) contained seven male and six female *E. confluens*, approximate volume, one liter; wet weight 1150 grams; dry weight, 325 grams; or one *confluens* per 77 ml. of mold, or one per 88 grams of wet mold. Combined these two collections give: One *confluens* per 60 ml. mold, or one per 58 grams of wet mold. In comparison Park (Park et al., 1950, p. 39) found one pselaphid per 109 grams of wet beech tree hole mold from a climax Michigan forest, and an average of 22 pselaphids per beech tree hole. His figures for *E. confluens* were 109 per beech tree hole, and one *confluens* per 127 grams of wet beech mold. In tree hole number 2 above there were also two male and four female *P. linearis*, one *linearis* per 167 ml. of mold, or one per 192 grams of wet mold. Under optimum conditions any of the species might be locally abundant. For example, one sawdust pile in Alabama yielded 22 male and 23 female *P. spinifer* by Berlese, and another larger sawdust pile at Seward, Pennsylvania produced 27 male and 21 female *P. linearis* in two days by hand collecting under slash, and by Berlese.

HABITAT. The primary factors which control the distribution of the four genera are the biotic and physical influences of the floor stratum of forests. The stability of the climax forest and later stages of forest microseres meets the requirements of these animals. Their small size enables them to interpose between themselves and the macroenvironment an extensive shield of decaying vegetable material. Here in dark, cool, moist, and above all stable environments they find near optimum conditions.

MICROHABITAT. Probably as many as 90 percent of the species in the *Euplectus* complex are normally found in decayed woody material such as log mold and tree holes, but a few species are found more frequently in other specific kinds of moist litter. Within these habitats the effects of microsuccession are evident. Early stages in the microsere are seldom inhabited, although some populations may thrive under loose bark. Generally, the nearer to the mounding stage in the log microsere, the greater chance for successful occupation of the debris by populations of euplectines. For most logs a gradual development on a temperate forest floor of from five to 10 years is best; for tree holes the time is slightly longer; for manure piles, haystacks, and sawdust piles five to 20 years development produces suitable conditions.

In the taxonomic section complete habitat data were listed when available. Of 516 collections, 160 had no habitat data. The remaining 356 collections had habitat niche information. This is summarized in two tables. Table 1 lists the recorded number of times a particular species was collected in a given habitat, and Table 2 lists the percentages of occurrence for each species.

TREE HOLES. The ecology of the tree hole habitat has been studied by Park and others in some detail (Park et al., 1950; Park and Auerbach, 1954). Of all the tree holes studied by Park, 58 percent contained pselaphids. Of the four genera in this study 49.1 percent of 356 collections, and 11 of the 23 species were taken from tree holes. These high numbers are partially due to the preference of *E. confluens* for this habitat niche. In Park's study, 80 percent of the pselaphids from tree holes were *confluens*, and in my collections of the *Euplectus* complex species from tree holes, 69 percent were *confluens*. Beech (*Fagus grandifolia*), maple (*Acer saccharum*), and

TABLE 1.
Frequency of Habitat Niches

	Beech tree hole	Maple tree hole	Oak tree hole	Other tree hole	Total tree hole	Under bark	Sawdust	Log mold or stump mold	Leaf mold	Floor litter	Manure	Compost	Mammal nest	Moss or fungus	Black or white light	Unknown	Total
Euplectus																	
confluens	43	18	14	47	122			2		3			2			14	144
longicollis	7	4		3	14		2	5		1						11	33
filiformis							1			1						2	4
karsteni		1	2	8	11		1				4	5		m1		13	35
californicus						1											1
acomanus						2										3	5
idahoensis									1								1
elongatus						1			1							3	5
duryi							1	7		2						21	31
signatus											9	3				1	13
																	272
Pycnoplectus																	
linearis	2	1	2	1	6	10	5	10	1	1				f1	b4	21	59
interruptus		1	3	2	6			3								11	20
cediosus								1								1	2
parki																6	6

TABLE 1 (continued).

	Beech tree hole	Maple tree hole	Oak tree hole	Other tree hole	Total tree hole	Under bark	Sawdust	Log mold or stump mold	Leaf mold	Floor litter	Manure	Compost	Mammal nest	Moss or fungus	Black or white light	Unknown	Total
Pycnoplectus (continued)																	
sexualis				1	1		1			1			*dusk flight		*1	3	7
spinifer				2	2	2	4	5		7					w1	8	29
infossus		1		1	2		3	2								2	9
congener			2	2	4	1	1	7		1						11	25
longipennis							1	5								2	8
falcatus								1									1
difficilis			1		1											2	3
																	169
Leptoplectus																	
pertenuis			3	4	7	1	6	24	2	8				m1		24	73
Acolonia																	
cavicollis						1										1	2
	52	26	27	71	176	19	26	72	5	25	13	8	2	3	5	160	516

Habitat Niches from which collections were made. Habitat data was not available for all collections, but the total number of collections is listed in the column on the right. Other numbers indicate the number of collections per habitat for each species. Abbreviations: Moss (m) or fungus (f); black (b) or white (w) light.

TABLE 2.

PERCENTAGE OF OCCURRENCE IN KNOWN HABITATS

	Beech tree hole	Maple tree hole	Oak tree hole	Other tree hole	Total tree holes	Under bark	Sawdust	Log mold or stump mold	Leaf mold	Floor litter	Manure	Compost	Mammal nest	Moss or fungus	Black or white light	Total no. of known habitats
Euplectus																
confluens	33.1	13.8	10.8	36.1	93.8			1.5		2.3			1.5			130
longicollis	31.8	18.2		13.6	63.6		9.1	22.7		4.5						22
filiformis							50			50						2
karsteni		4.5	9.1	36.4	50		4.5				18.2	22.7		m4.5		22
californicus						100										1
acomanus						100										2
idahoensis									100							1
elongatus						50			50							2
duryi							10	70		20						10
signatus											75	25				12
Pycnoplectus																
linearis	5.3	2.6	5.3	2.6	15.8	26.3	13.1	26.3	2.6					f2.6	b10.5	38
interruptus		11.1	33.3	22.2	66.6			33.3								9
cediosus								100								1
parki																0

TABLE 2 (continued).

	Beech tree hole	Maple tree hole	Oak tree hole	Other tree hole	Total tree holes	Under bark	Sawdust	Log mold or stump mold	Leaf mold	Floor litter	Manure	Compost	Mammal nest	Moss or fungus	Black or white light	Total no. of known habitats
Pycnoplectus (continued)																
sexualis				25	25		25		25						flight 25	4
spinifer				9.5	9.5	9.5	19.0	23.8	33.3						w4.8	21
infossus		14.3		14.3	28.6		42.8	28.6								7
congener			14.3	14.3	28.6	7.1	7.1	50	7.1							14
longipennis							16.7	83.3								6
falcatus								100								1
difficilis			100		100											1
Leptoplectus																
pertenuis			6.1	8.2	14.3	2.0	12.2	49	4.1	16.3				m2.0		49
Acolonia																
cavicollis						100										1
TOTAL %	14.6	7.3	7.6	19.9	49.1	5.3	7.3	20.2	1.4	7.0	3.6	2.2	0.5	0.5	1.6	356

This table lists the percentages of occurrence in a given habitat niche based on collections where habitat was known. Abbreviations: Moss (m) or fungus (f); black (b) or white (w) light.

oak (*Quercus* spp.) have provided most of the tree holes, and the following trees have produced some records: hemlock (*Tsuga*), hickory (*Carya*), tulip-tree (*Liriodendron*), sycamore (*Platanus*), basswood (*Tilia*), cucumber magnolia (*Magnolia acuminata*), elm (*Ulmus*), birch (*Betula*), black cherry (*Prunus serotina*), and chestnut (*Castanea*) in earlier collections.

UNDER BARK. Five and three-tenths percent of the collections were from under bark, and this habitat has probably produced many of the earlier specimens which do not have habitat records. Of the 23 species eight have been found under bark, and three, *E. californicus*, and *acomanus*, and *A. cavicollis* have only been found here. The latter two have been found only under pine bark, and this may be true too of *californicus* considering its locality (Lake Tahoe).

SAWDUST. Old sawdust piles, especially those which are partially shaded, have produced 7.3 percent of the collections and 11 of the 23 species. Frequently, cut slabs or slash may be mixed with sawdust, and beetles can be found in the sawdust itself, on the surface of slabs buried in sawdust, and under the bark of slabs. Sawdust directly exposed to sun often has relatively high internal temperatures. Pselaphids in the *Euplectus* complex were found only in the cooler, shaded areas, but some genera, *Batrisodes* and *Tmesiphorus* have been found in relatively warm spots.

LOG MOLD. Well decayed log mold has produced 20.2 percent of the collections and 12 of the 23 species. Stump mold is included here.

FOREST FLOOR LITTER. This is the most varied and least understood of all microseres. Various qualities of litter are found from a mat of entire, newly fallen leaves several inches thick, to a thin barely perceptible covering over mineral soil. Designations such as duff, leaf mold, ground-cover, litter, and more exacting "*Rhododendron* duff on steep hillside" are commonly used. Forest floor litter and leaf litter combined have produced 8.4 percent of recorded collections, and 11 of the 23 species.

OLD COMPOST AND OLD MANURE. These two microseres have produced only two species, *E. karsteni* and *signatus*, and 2.2 percent and 3.6 percent respectively of recorded collections. *E. signatus* has been collected only in these habitats, although European populations of this species are reported from other habitats. The compost category includes haystacks, strawpiles, corncob piles, grass heaps, and the "compost pile" of organic gardeners. In all cases manure collections were from well-decayed and mixed material, *e.g.*, manure mixed with straw, hay, sawdust, or wood chips. One consistently productive manure pile in a forgotten corner outside a riding stable (Cook County, Illinois) contains both of these species of *Euplectus* as well as manure worms (*Eisenia foetida*?), dermapterans, isopods, pseudoscorpions, ptiliids, and a variety of other forms.

Only 2.6 percent of the collections were from habitats other than those already listed. *Moss.* Although frequently productive of pselaphids only two of the 23 species were found in moss: One male *E. karsteni*, and two male *L. pertenuis*. *Polypore fungus.* One record only of 1 male *P. linearis* from a rotting polypore. *Mammal nest.* One record only of three male and four female *E. confluens* from a squirrel nest on an oak branch. *Light collections. P. linearis* has been collected four times in a black-light trap run through an entire year at Hart Woods near Urbana, Illinois by M. W. Sanderson. One record of *P. spinifer* from Gainesville, Florida at white (?) light completes the light catch records. H. Dybas collected a male *P. sexualis* in dusk flight near Mobile, Alabama, so occasionally these beetles do fly.

ADDITIONAL PUBLISHED RECORDS. Thompson in 1924 reported *Euplectus brunneus* Grimmer from prairie sod in Aberystwyth, Wales. But this is the only record of the genus from grassland. E. A. Hicks (1960) in his book on insects occurring in birds' nests lists nine pselaphids. Six of these are *Euplectus*: *karsteni*, *nanus*, *piceus*, *punctatus*, *sanguineus*, and *signatus*, all are European records. The species of birds whose nests were most often associated with *Euplectus* are the following: *Ciconia ciconia* L., *Sternus vulgarus* L., *Turdus philomelus* Brehm, *Delichon urbuca* L., *Apus apus* L., *Falco tinnunculus* L., *Dryocopus martinus* L., *Erithacus rubecula melophilus* Hart.

BEHAVIOR

Observations were made in the laboratory of living *Euplectus confluens* in plaster of paris chambers with glass covers. The beetles seemed to actively explore the chamber and investigate all cracks and pits. If the glass cover was removed even for a few seconds, the beetles would escape. Some individuals tried to burrow between the plaster and the glass apparently attempting to escape. During brief observations when the beetles had been in the dark, or at cool temperatures below 18°C, they were usually quiet.

The rate of locomotion for *E. confluens* is about 2 mm per second on an even surface (in a near saturated atmosphere; 50 foot candles illumination; 24°C). A positive thigmotaxis was often shown. If a bit of paper or wood was placed with the beetles they would usually take a position between the object and the floor of the chamber even in the dark. The beetles tended to aggregate on objects placed in the chamber, but when in a bare chamber they remained solitary. When at rest beetles showed equal preference for horizontal, vertical, or inverted positions, hanging upside down from the glass cover or a piece of paper.

A beetle isolated in a microchamber with a pitted floor moved with its antennae horizontal and at a 45° angle from the body axis. When a pit was encountered an antenna would dip into it as if exploring its contents. This might be done without the beetle breaking stride if the pit were small. When a large pit was encountered the antenna was introduced first and then the head followed. After a second, the beetle backed out and continued on. When walking, the beetles hold the antenna out, as mentioned; often the club will tap the surface much the same as a blind man using a cane.

Cleaning actions of a female *E. confluens* were thus: Antenna—an antenna was bent down and the proleg reached up to grasp it. It was then moved to the mouthparts and drawn through the maxillae. Dorsum—this was cleaned by the metalegs, one or the other being swung over the back and drawn posteriorly in a combing motion. The metatarsi were then cleaned by rubbing them together behind while the beetle balanced on the four front legs. The cleaning of an antenna and the combing of the dorsum was briefly carried on at the same time.

Encountering reactions of a female *E. confluens* toward another female consisted of stopping, tapping the other beetle with the antenna, and then moving on. When food animals were encountered the beetle would hesitate, and then lunge forward grabbing the prey, *e.g.*, a mite, with its mandibles. The prolegs might be braced against the integument of the prey to add leverage. Usually large mites and other beetles were simply ignored. A large male pseudoscorpion, *Mirochernes dentatus* (Banks), was kept in a chamber with three *E. confluens* for several days. I believed that the *Mirochernes* might attack the pselaphids, but instead a mutual avoidance was established. Only once when the pseudoscorpion was excited, he grabbed a beetle by the head with a chela but immediately let it go without damaging it.

In humid chambers at 24°C, *E. confluens* was unreactive to diffuse light of 50 foot candles. If offered a choice of light or dark halves, either was randomly selected. Only under the higher intensities of a microscope spotlight did the beetles select the dark half of the chamber, but still they made short ventures into the lighted half.

DISTRIBUTION

Euplectus, *Pycnoplectus*, and *Leptoplectus* are well represented in the Eastern United States. *Acolonia* is known from only two collections, one in Northeastern and one in central Western Florida. Although some species are associated with conifer forests and others with manure or compost, the majority are found within the Eastern Deciduous Forest Biome and its ecological equivalents. Forests of the Mississippi Valley, from coastal Alabama north through the Appalachian Mountains, and forests of the Great Lakes region, have produced the most abundant collections.

Leptoplectus ranges from Maine to the Mississippi River and south to Florida. *Pycnoplectus* shares most of this range, but some species such as *falcatus*, *difficilis*, and *infossus* are restricted to the Appalachians; *linearis*, *interruptus*, and *spinifer* in comparison, have scattered distributions.

The *confluens* group of *Euplectus* is widely found east of the Mississippi River, but does not occur abundantly in the South. *E. confluens*, the most abundant eastern species with 144 collection records, has two disjunct records, one from Arkansas and the other from Idaho! Efforts to find populations which would indicate a continuous range for this species have been unsuccessful. Two species in the *californicus* group of *Euplectus*, *idahoensis*, and *californicus*, are thus far endemic to their name states; *elongatus* is restricted to the East. *E. duryi* and *acomanus* show widely disjunct ranges, *duryi* frequent in eastern states is recorded from Colorado and Idaho, *acomanus* from New Mexico to Indiana, to Maryland.

Remarkably, two European *Euplectus*, *karsteni* and *signatus* were collected here. *E. karsteni* fits the characteristics and ecology of the *confluens* group, and was collected 22 times, half from tree holes, and about half from manure and compost. *E. signatus*, collected 10 times, was found only in manure and compost in the Great Lakes region and near the St. Lawrence seaway. This suggests that *signatus*, and and perhaps *karsteni* as well, have been introduced with compost or with livestock. Park (1953) reported another European pselaphid, *Trichonyx sulcicollis* (Reichenbach), from New York, which may have been introduced in nursery stock.

ABBREVIATIONS

Museums and private collections

ANSP	—Academy of Natural Sciences, Philadelphia, Pennsylvania
CASA	—California Academy of Sciences, San Francisco, California
CMNH	—Cincinnati Museum of Natural History, Charles Dury collection, Cincinnati, Ohio
FMNH	—Field Museum of Natural History, Chicago, Illinois
HS	—Harrison Steeves, Jr., collection, now at FMNH

ICCM —Carnegie Museum, Ulke collection, Pittsburgh, Pennsylvania
INHS —Illinois Natural History Survey, Urbana, Illinois
JAWC —John A. Wagner collection, Evanston, Illinois
MCZC —Museum of Comparative Zoology, LeConte and Fall collections, Cambridge, Massachusetts
OP —Orlando Park collection, now at FMNH
OSUC —Ohio State University, H. W. Wenzel collection, Columbus, Ohio
Paris —Museum National d'Histoire Naturelle, Raffray collection, Paris, France
USNM —United States National Museum, Casey collection, Washington, D.C.

Used in habitat records

TH —tree hole
TCH —tree crotch hole

Used in literature citations

cat. citation —catalog citation
descrip. note—descriptive note
descript. —description (full)
distr. data —distribution data
distr. rec.(s)—distribution record(s)
ecol. —note on ecology
key ref. —placement in a key

Used in figure captions

SEM —Scanning Electron Microscope

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   Dorsum reddish brown; at most only the posterior marginal area of the pronotum yellowish 6

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